

CONFERENCES - INTERNATIONAL

IX

PROCEEDINGS OF THE

INTERNATIONAL BOTANICAL CONGRESS

MONTREAL, AUGUST 19-29, 1959

VOLUME IIA
ABSTRACTS
RÉSUMÉS



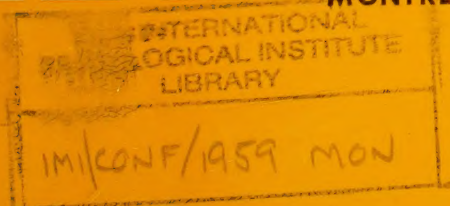
IX

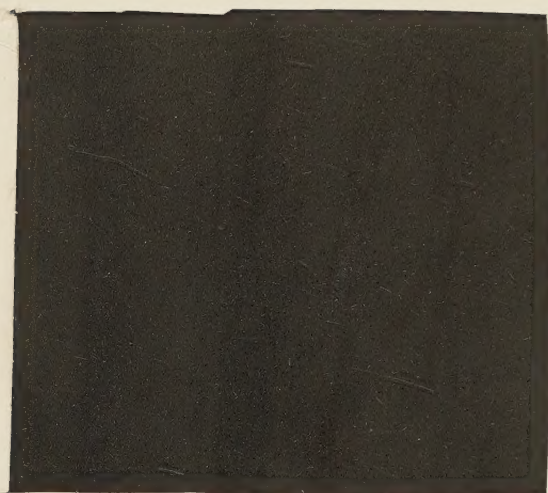
COMPTES RENDUS DU

CONGRÈS INTERNATIONAL DE BOTANIQUE

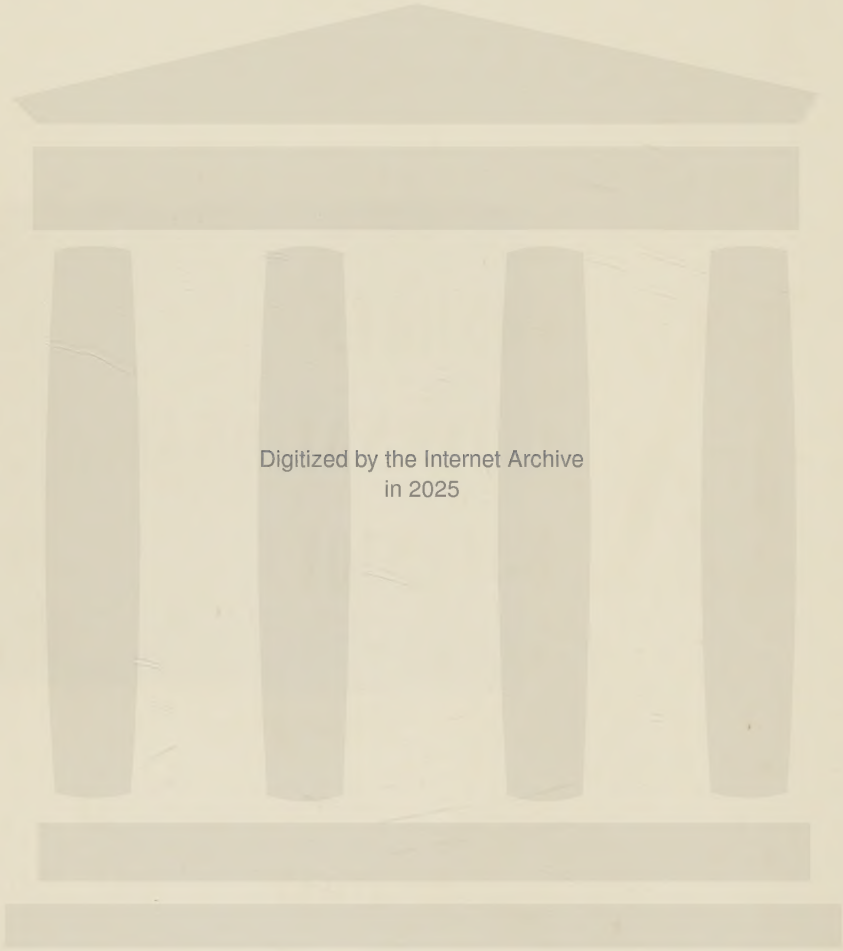
MONTREAL, 19-29 AOÛT 1959

CONF/1959 MON





IX INTERNATIONAL BOTANICAL CONGRESS



Digitized by the Internet Archive
in 2025

Proceedings of the

Foreword

THIS VOLUME of the Proceedings (Volume IIA) includes all abstracts of invited and contributed papers received between May 15, 1959 and August 1, 1959. Volume II and Volume IIA are intended to be used as adjuncts to the Program (Vol. I of the Proceedings).

In the Program the titles and authors of papers are listed in the sequence in which they will be presented, the program of each Section being given separately. An Index to authors' names readily permits location of a specific paper.

In Volumes II and IIA the abstracts are arranged alphabetically by authors' names with cross references where there is more than one author.
Comptes rendus du

IX CONGRÈS INTERNATIONAL BOTANIQUE

Montreal, August 19-29, 1959

VOLUME II A
ABSTRACTS/RÉSUMÉS

Mortimer Limited

Proceedings of the

Foreword

THIS VOLUME of the Proceedings (Volume IIA) includes all abstracts of invited and contributed papers received between May 15, 1959 and August 1, 1959. Volume II and Volume IIA are intended to be used as adjuncts to the Program (Vol. I of the Proceedings).

In the Program the titles and authors of papers are listed in the sequence in which they will be presented, the program of each Section being given separately. An Index to authors' names readily permits location of a specific paper.

In Volumes II and IIA the abstracts are arranged alphabetically by authors' names with cross references where there is more than one author for a paper. By using the Program and Abstract Volumes together a member of the Congress can readily locate and read the abstract of any paper listed in the Program.

Avant-propos

CE VOLUME IIA des Comptes rendus comprend les résumés de toutes les communications que le Congrès a reçues entre le 15 mai et le 19 août 1959. Les volumes II et IIA sont publiés à titre de compléments au livre-programme (volume I des comptes rendus).

Dans le programme les titres et auteurs des exposés sont classés dans l'ordre suivant lequel ils seront lus, le programme de chaque section faisant l'objet d'un groupement distinct. Un index des noms d'auteurs permet de trouver promptement l'emplacement d'un exposé donné.

Dans les volumes II et IIA, les exposés sont disposés alphabétiquement par noms d'auteurs, avec renvois dans le cas où plusieurs auteurs ont signé le même article. Par l'emploi simultané du Programme et du recueil d'exposés, les Congressistes pourront rapidement retrouver et lire le condensé de tous les exposés qui figurent au Programme.

AUERBACH, S. I. Health Physics Division, Oak Ridge National Laboratory, U.S.A. *The ecology of White Oak Lake bed — A radioactive waste area, Part I.* For 12 years White Oak Lake received a continuous input of low-level radioactive wastes. Four years ago the basin was drained, leaving about 14 hectares of contaminated calcareous sediment. Prompt invasion of the lake bed by plants and animals provided an unusual opportunity for studies on the fate of fission products in terrestrial ecosystems and on their possible biological effects.

There is significant transfer of strontium-90, cesium-137, and cobalt-60 from this soil to plants growing on the bed and from the plants to herbivorous insects. On a typical square meter, there were 48 μC of strontium-90 in the soil; 0.3 μC in 838 g of *Bidens* sp.; and 0.00002 μC in 200 mg of herbivorous insects. There was considerably more cesium-137 in the soil, less in the plants, and about the same activity in the herbivorous insects. These data imply that more cesium-137 than strontium-90 is transferred from plants to insects. The considerable variation in accumulation of radioisotopes is related to concentration in the soil, plant organ, and plant or animal species involved. See DeSelm, H. R. and Royal Shanks for Part II of this paper.

AVADHANI, P. N., S. K. GRISDALE, R. K. IBRAHIM and G. H. N. TOWERS. McGill University, Montreal, Canada. *Paper chromatography of phenolic compounds.* One and two directional paper chromatograms of some naturally-occurring phenolic compounds will be shown. These include the phenolic acids and glycosides of *Gaultheria*, *Malus*, *Hydrangea* and *Pyrus* developed in different solvents and treated with different reagents.

Autoradiographs showing the distribution of radio-activity in some of these compounds from plants administered C^{14} labelled compounds will also be displayed.

BANBURY, GEOFFREY H. Durham University, United Kingdom. *Morphogenetic mechanisms of the Mucoraceae.* Sporangium formation in *Phycomyces* was accelerated by white, but not red, light; it was neither induced nor prevented by I.A.A., gibberellin and griseofulvin. Griseofulvin caused subsequent growth in a steep righthanded helix, a form also found in Stage 1 after prolonged culture in darkness, and when high turgor is induced.

Observations on growth injury effects and branching of detached sporangiophores indicate a possible apical dominance and no immediate limiting influence from the substratum. No direct evidence was found for a wound hormone.

Plempel's demonstration and isolation of zygogenic gamones or "sex hormones" in *Mucor mucedo* and other related genera, and his views on zygotropism are reviewed. Evidence is presented for volatile zygotropic gamones.

BANBURY, GEOFFREY H. Durham University, England. *Phototropism of fungal hyphae.* The light-growth-response, LGR, of hyphae may be (+), as in *Phycomyces* sporangiophores, or (−) as in *Botrytis* germination hyphae. In transparent hyphae a (+) LGR gives a (+) tropic response, as does the (−) LGR of the opaque young sporangiophore of *Pilobolus Kleinii*. Experiments indicate that 3-indoleacetic acid is present within, but

does not seem to regulate the growth of chitin-walled fungi. Riboflavin appears to be an effective photoreceptor in fungi; the photoreceptors in *Phycomyces* probably have a predominant orientation peripherally in planes perpendicular to the long axis. LGRs are independent of substratum, and involve elastic changes in shape; phototropic responses are largely unaffected by spiral wall growth. Adaptation may be averaged over a wider azimuthal segment than perception.

BIRAND, H. University of Ankara, Turkey. *Über Spross- und Wurzelwachstum einiger Xerophyten*. Samen von einer Reihe Pflanzen der zentral-anatolischen Steppe, die in früheren Arbeiten ökologisch und nach ihrem Wasserhaushalt untersucht worden waren, wurden ausgesät und von Beginn der Keimung and während einer Vegetationsperiode in kurzen Zeitabständen nach ihrem Spross- und Wurzelwachstum geprüft. Die Wurzeln zeigten ein schnelleres Längenwachstum und erreichten in einer Vegetationsperiode eine lange Dimension; während die Sprosse eine sehr träge Entwicklung aufwiesen und zwergig blieben.

Dasz das Sprosssystem in der 1. Vegetationsperiode zwergig und nicht ausgebildet blieb, dagegen das Wurzelsystem gut und lang entwickelt war, ist natürlich für einen ökonomischen Wasserhaushalt sehr zweckmässig. Dieses Verhalten erweckt aber den Eindruck, dasz die Pflanzen den grössten Teil ihrer Assimilate zum Nachteil des Sprosssystemes für den Aufbau des Wurzelsystemes benützen. Dem ist aber nicht so; denn durch die gleichzeitige Ermittlung der Trockengewichte der Spross- und Wurzelsysteme zeigte sich, dasz diese Pflanzen für deren Aufbau fast gleiche Mengen an Assimilaten verwenden; bei der plastischen Bearbeitung derselben aber, d.h. bei dem Aufbau der ober- und unterirdischen Organe eine sehr geschickte Architektur vollbringen können.

BLACK, L.M. University of Illinois, Urbana, U.S.A. *Wound tumor disease*. The recent findings of several investigators on wound-tumor disease are briefly reported and discussed. These include serological measurements of the increase of soluble antigen in leafhopper vectors following injection of virus, selection of efficient and poor vector races for the causal virus, the effect of heat treatment on the proportion of virus-free cuttings from diseased plants, and first estimates of the approximate number of virus particles in tumors and vectors.

BLACK, M. AND P. F. WAREING. University of Saskatchewan, Saskatoon, Canada and University College of Wales, Aberystwyth, United Kingdom. *The inhibition of germination of seeds by radiation*. Using a series of interference filters it has been found that germination of light-inhibited seeds such as those of *Nemophila insignis* is inhibited not only by the far-red (maximum at 710 m μ) but also by a region in the blue (maximum c. 450 m μ). At an intensity of 80 μ w cm², much longer periods of irradiation with blue are required than with infra-red.

The blue region has also marked effects on light-promoted seeds, such as Grand Rapids lettuce, promotion of germination being obtained with

short periods of irradiation, and inhibition with longer periods; these effects are greatly modified by the duration of the inhibition period prior to irradiation. The promotive effects of red irradiation on Grand Rapids lettuce can be reversed by blue in the same way as by far-red, but longer irradiation periods are needed with blue than with far-red.

With the light-requiring seed of *Betula pubescens*, blue alone has no effect on germination, but there is a marked interaction between blue and red, blue being either promotive or inhibitory, depending upon whether the exposure is given before or after exposure to red. The implications of these observations on current views regarding the photoreceptor systems involved are discussed.

BLAIR, W. FRANK. The University of Texas, Austin, U.S.A. *Effects of radiations on natural populations of vertebrates*. Natural populations of organisms presumably exist in equilibrium between genetic mutation and selective elimination of deleterious mutants. Interplay between these acts to maintain each local population at an adaptive peak. A critical question in an era of actual and potential increase in the presence of mutagenic agents in the environment is one of the reaction of natural populations to increased mutation pressures. What pressures of genetic damage are populations able to withstand; what effects will there be from an increase in one of the normally counter-acting forces that maintain populations at adaptive peaks?

One reasonable approach in our present state of knowledge is to measure "population success" in terms of the maintenance of numbers in the local breeding population. Populations of deer-mice (*Peromyscus maniculatus*) and wood-mice (*Peromyscus leucopus*) have maintained themselves despite x-irradiation of males as they reached sexual maturity with gonadal doses of 500r and 700r, respectively. Litter size is reduced by dominant lethal mutations, but population levels are maintained through presumed density-dependent effects. After five years of study, the populations seem to be maintaining themselves through this mechanism and presumably through the selective elimination of radiation-induced deleterious mutations. Work is also being done with the Mexican toad (*Bufo valliceps*).

BÖCHER, TYGE W. Botanisk Laboratorium, Copenhagen, Denmark. *The evolution of arctic and montane plant taxa in the light of chromosome studies and comparative cultivations*. The age, origin, center of origin and migrations of arctic or montane plant taxa have been studied by several, but only few have tried to base their arguments on comparative cultivations and cytological observations. However, important questions like range of variability in various parts of an area, possible biotype depauperation during migrations or perglacial survival or the influence of geographical isolation may be raised from a purely theoretical level, if plants from several stations within the total range of a species are brought together and studied under controlled and uniform conditions. A different content of races in different parts of an area may explain a local deviating ecological behaviour and distributional pattern. Difficulties with the cultivation of plants from the Arctic and high mountains have so far made larger progress impossible. Still, some important results have already been obtained.

A. One chromosome number.

1. Racial divergencies within Greenland: *Viscaria*, *Draba aurea*, *Draba hirta*.
2. Racial differences between arctic and alpine European populations: *Juncus trifidus*, *Sibbaldia procumbens*, *Arabis alpina*.
3. Racial differences between West- and East-arctic populations: *Saxifraga aizoon*, *Viscaria alpina*, *Ranunculus acris*.

B. Two or more chromosome numbers.

1. Racial level: Accidental tetraploid race: *Dryas octopetala* (Alps).
2. Varietal-specific level: *Arabis holboellii*.
3. Subspecific-specific level: *Anthoxanthum odoratum* coll., *Stellaria longipes* coll., *Trisetum spicatum* coll., *Campanula rotundifolia* coll.

Most arctic or montane species groups are probably of tertiary origin. Within these groups a considerable formation of species (or subspecies) took place during the quarternary age and up to recent days and was highly supported by geographic isolation (gaps created by sea, ice, or uninhabitable lowlands) or by genetical barriers (polyploidy, apomixis). In a case like *Campanula rotundifolia* the ancient diploid species in Arctic and montane areas seem to have developed auto- and allotetraploids which in recent time blur the species limits and fill up the gaps between the diploids.

BORMANN, F. H. and B. F. GRAHAM. Dartmouth College, Hanover, U.S.A. *A study of intraspecific root grafts in white pine, Pinus strobus L., utilizing radioisotopes and dyes.* Tracer techniques, utilizing rubidium 86, phosphorus 32, and acid fuchsin dye, were developed for the detection of intraspecific root grafts; and a study of their occurrence in white pine growing in northern New England was made. It was found that grafts between trees were common in stands of almost all ages and on all sites where white pine grows. Groups of trees were often united by an extensive complex of self grafts and intraspecific grafts. In many stands, roots of seemingly dead trees were found to be alive and grafted to intact living trees. Many intraspecific grafts were found to be functional in the translocation of food, water, and minerals, while others apparently were non-functional. It is suggested that groups of trees grafted together may behave as parts of an organic union, rather than as individuals in competition with each other.

BRAMBLE, WILLIAM C. Purdue University, Lafayette, U.S.A. *Use of chemicals to control forest vegetation.* Use of chemicals to control forest vegetation is not new but has developed rapidly in recent years. Sodium arsenite, 2, 4-D and 2, 4, 5-T compounds, and sodium sulphamate are in common use for cleanings, liberation cuttings, thinnings, and improvement cuttings that involve single tree removal. Mass removal by aerial spraying

and ground rigs is used to control hardwoods and release conifers in several forest regions. Plant succession is retarded or set back in these operations. Most prominent among these are the pine-hardwoods in the South, Douglas fir-hardwoods in the West, pine-hardwoods in the Lake States, and pine-hardwoods in the Northeast.

BRUNEL, JULES. Université de Montréal, Canada. *Contribution à l'étude des Chaetoceros du golfe Saint-Laurent*. Au cours de deux saisons d'étude (1954 et 1955) à la Station de Biologie marine de Grande-Rivière, Qué., l'auteur a entrepris l'étude du phytoplancton de la baie de Chaleur, dans le but d'établir une iconographie photographique de référence destinée à faciliter l'identification des espèces. Plus de mille photomicrographies en contraste de phase ont été exécutées, illustrant tous les groupes d'algues représentés dans le plancton végétal du golfe Saint-Laurent. Dans le seul genre *Chaetoceros*, au moins 24 espèces ont été identifiées et photographiées, aussi bien à l'état végétatif qu'au moment de la formation des hypnospores. L'auteur commente quelques-unes de ces photomicrographies.

BURKART, ARTURO. Universidad Nacional de La Plata, Argentina. *Ensayo de subdivisión naturel del género sudamericano Adesmia (Leguminosae)*. *Adesmia* es género grande, natural, de posición aislada en las Papilionoideae - Sophoreae. Toeme, más de doscientas especies y numerosas formas híbridas. Es exclusivo de Sudamérica, extendiéndose desde Perú y sur de Brasil hasta Tierra del Fuego. No hay monografía completa y los ensayos de subdivisión son imperfectos. Se divide el género en dos subgéneros: *Adesmia*, *species inermes* y *Acanthadesmia novum subgenus*, *frutices racemis spinosis*. Después se fundan cuarenta series agrupando las especies afines, y dando una clave dicotómica para estas series; se da la diagnosis latina de cada una, la especie tipo y la nómima de las especies con su distribución geográfica general; finalmente una lista sinonímica general de todas las especies conocidas, un mapa general de distribución y diagnosis de algunas especies nuevas. - Este trabajo es una colaboración con el Instituto de Botánica Darwinion de San Isidro, Argentina. Se han consultado los principales herbarios del mundo.

BURROWS, ELSIE M. Liverpool University, United Kingdom. *Experimental ecology with particular reference to the ecology of Laminaria saccharina (L.) Lamour*. Many factors are involved in determining whether a marine alga is able to occupy a particular habitat. Important among these is the ability of the plants to settle in, and survive, unfavourable conditions (such as shading by adult plants) and to take advantage rapidly of improved conditions. For marine algae, the sporeling is therefore a critical stage in the life-history. The problem of its relationship with its environment will only be solved by exhaustive experimental studies.

Laminaria saccharina has been grown successfully in culture and its response to different environmental conditions tested. While the plants grow readily under a wide range of temperature with little change in growth rate, light intensity has been found to be a much more important factor controlling the rate of growth. Under low light intensity growth can

be almost completely suspended for as much as six months and resumed again when the intensity is increased. The tolerance of this species to a wide range of temperature coupled with its ability to endure long periods of low light intensity, enable it to grow over a very wide area covering both North Temperate and Arctic regions.

BYRNES, WILLIAM R. The Pennsylvania State University, University Park, U.S.A. *Vegetation management on utility rights-of-way*. The major objective of vegetation management on established utility rights-of-way is the control of tall-growing woody brush which may interfere with transmission line performance and subsequent maintenance. Prior to 1946, this unwanted vegetation was controlled primarily by mechanical means, such as hand-cutting. With the advent of the synthetic hormone herbicides 2,4-D and 2,4,5-T in the mid 1940's, chemical brush control, which is more economical, practically replaced mechanical procedures. Several techniques for the commercial application of herbicides to vegetation on rights-of-way have evolved. The most prominent among these are the broadcast foliage, stem-foliage, semi-basal, root collar basal, stump, and soil applications. These techniques vary in mode of application, type of carrier, and the relative concentration and volume of herbicide utilized. All treatments when properly applied give acceptable control of woody brush. From an ecological viewpoint, the broadcast foliage treatment, which is applied as a "blanket" spray to all vegetation, generally results in a major disturbance and often complete alteration of the plant community comprising the ground layer vegetation. The stem-foliage and semi-basal techniques are intermediate in this respect, while the root collar basal and stump treatments selectively removes the unwanted brush and causes the least disturbance to ground layer plants.

CASSIE, VIVIENNE. New Zealand Oceanographic Institute, Wellington, New Zealand. *Phytoplankton in New Zealand coastal waters*. One hundred and eighty phytoplankters including 112 diatoms and 42 dinoflagellates, have been identified from New Zealand waters. Quantitative counts of every plant and animal species were made from monthly surface jar samples at 5 stations (2 in the Hauraki Gulf, 2 in Wellington Harbour and one in S.E. Cook Strait) during 1957-58. In the Hauraki Gulf, the richest area, diatoms predominated during most of the year, chiefly *Thalassiothrix nitzschoides* and *Thalassiosira hyalina*. In Wellington Harbour, diatoms ceased abruptly to dominate in the surface layers during May (early winter). Peak production in both localities was in early autumn. At Cape Campbell (S.E. Cook Strait) numbers of species and individuals were much smaller than in the Hauraki Gulf and Wellington Harbour.

From an examination of stereo pairs of electron micrographs of the valve structure in *Biddulphia mobiliensis*, a new interpretation of the siliceous meshwork is presented.

CRAFTS, A. S. University of California, Davis, U.S.A. *Metabolic inter-relations between phloem and xylem*. Xylem and phloem represent two distribution systems within the plant. The former is responsible for long

distance transport of water and salts taken up by roots; the latter for long distance movement of assimilates elaborated in leaves. I favor the view that the interconnected sieve tubes of the phloem act as an elongated differential osmometer functioning under a gradient of turgor pressure. The xylem acts as a uniform source of water for this system.

Uptake of mineral elements by roots is visualized as a metabolic accumulation by root hairs and cortex parenchyma, symplastic movement across the endodermis and into the ground parenchyma of the central cylinder, and release from symplast to apoplast within ground tissue. This process is virtually a secretion conditioned by gradients of decreasing O_2 and increasing CO_2 from cortex to stele. Minerals follow the course of least resistance from cell walls into the xylem ducts; water follows osmotically, solution moves upward resulting in guttation or xylem exudation. The same system is visualized but water moves faster and under reduced pressure when transpiration is high.

Foods synthesized in chlorenchyma move via the symplast to the sieve tube system and thence to sinks in shoot tips, cambia, roots, and storage organs. Presence of sugars, amino acids, etc. in sieve tubes results in osmotic uptake of water from xylem: removal of assimilates in sink regions may or may not require separation of solutes and water. Many organs resulting from growth have lower dry weight composition than the assimilate stream and hence require additional water from the xylem.

Assimilates may be lost from phloem of roots to the culture medium; they may also transfer to xylem and move to leaves in the transpiration stream. Hence certain materials may circulate in plants; probably phosphorus and potassium do this; possibly some organic compounds may. Agricultural chemicals and tracers applied to leaves are absorbed from the apoplast into the symplast; they may be transported with assimilates to regions of food utilization; they may move from phloem to xylem and circulate. Chemicals and nutrients present in the soil are absorbed into the symplast (cortex and ground parenchyma), released into the apoplast (cell walls and xylem conduits) and moved through stems to leaves where they are subject to uptake into the symplast. These too may circulate. Recently the apoplast has been renamed "Free space" by some plant physiologists.

DAHL, EILIF. Agricultural College of Norway, Vollebekk, Norway. *Pleistocene history of the flora in the North-Atlantic region with special reference to Scandinavia*. Strong phytogeographic connections exist between both shores of the North Atlantic and many species are restricted to the area (amphiatlantic species). The amphiatlantic distribution pattern may result from migration (long-distance or over former land connections) across the ocean or by reduction of formerly circumpolar areas. The long-distance dispersal hypothesis is rejected because no enrichment of dispersal types adapted to long-distance dispersal is found within the amphiatlantic elements. The hypothesis of formerly circumpolar areas is rejected because polymorphic taxa are identical or closely related on both sides of the Atlantic. Thus the hypothesis of former connection remains, but only species capable to live in subalpine climates could use the connection. This dates the connection to the Pliocene or Pleistocene. This

connection was probably over an early Tertiary basalt plateau broken up in the Pliocene or Pleistocene.

Since west arctic species are absent in the Alps the west arctic species of Scandinavia probably did not survive the last glacial age in Central Europe, but rather in refuges along the Atlantic coast. The high age of the arctic-alpine elements in Scandinavia is testified by relatively high endemism.

It seems agreed that glacial striae and erratics do not prove glaciation during the last glacial age. Possibly the mountain-top detritus is indicative of unglaciated areas during the last or former glacial ages.

DAHL, EILIF, Agricultural College of Norway, Vollebakk, Norway. *Scandinavian studies with special reference to arctic-alpine vegetation*. Macroclimate is modified by topography (local climate) and vegetation climate (microclimate) differs from local climate. Programs to elucidate the effect of topography on climate are discussed. The microclimate is also measured, but a useful tool is here estimation of heat balance budgets. As an example the temperature extremes of *Koenigia islandica* L. are discussed.

In alpine areas snow-cover is the most important factor. The uneven snow-cover creates a number of stable niches with vegetation of their own. These niches and their vegetation can not be fitted into a successional scheme, but must be classified and studied. Conditions can conveniently be measured by long-time radioactive temperature recorders. The results show that mean annual temperature in the soil surface may differ several degrees centigrade within a few meters due to the uneven snow-cover. Radioactive recorders and their possibilities are discussed.

DAS, NIRMAL K.

See PATAU, KLAUS and NIRMAL K. DAS

DE SELM, H. R. and R. E. SHANKS. University of Tennessee, Knoxville, U.S.A. *Ecology of White Oak Lake bed — a radioactive waste area, Part II*. The bed of the former White Oak Lake at the Oak Ridge U.S. Atomic Energy Commission Laboratory is under study. This is the site of the release of fission waste products for a period of years previous to 1956. The fate of these products is of particular interest in view of recent estimates of future nuclear power use.

The absorption and dispersion of variable amounts of these substances with reference to the soil body and vegetation is discussed.

This study is being supported in part by the U.S. Atomic Energy Commission under Contract AT(40-1)2077.

For Part I of this paper see Auerbach, S.I.

DE TOROK, DENES and PHILIP R. WHITE. Roscoe B. Jackson Memorial Laboratory, Bar Harbor, U.S.A. *Cytological instability in tumors on *Picea glauca**. Squash preparations made from primary tissue culture explants from adjacent normal and tumorous tissues of the white spruce show a striking difference in cytological behaviour. Chromosome counts in normal tissues are regularly 22 and such variation as we have found is probably due to technical errors. Counts in tumor tissues, on the other hand,

range from less than 10 to more than 60 with no statistically significant mode in the approximately 300 cells counted. This instability agrees with the nutritional instability of these same tissues previously noted by Reinert and White and resembles that reported by Partanen in *Osmunda*.

D'OLIVEIRA, BRANQUINHO and C. J. RODRIGUES JR. Coffee Rust Research Center, Oeiras, Portugal. *The coffee rusts*. Two rusts effect coffee plantations. One, *Hemileia vastatrix*, is present in Africa, Asia and Australia, only the American Continent being still free. The other, *H. coffeicola*, is as yet restricted to the Camerouns and the Islands of Fernando Po and S. Thome.

A survey of the physiologic specialization of the two rusts has been in progress since 1951 in the "Coffee Rust Research Center" in Portugal. Ten races and a few biotypes of *H. vastatrix* have been characterized out of more than two hundred samples received from different parts of the world; no specialization has been found in *H. coffeicola*.

Nine types of behaviour towards these 10 physiologic races have been recognized amongst the seedlings tested in different species of *Coffea*; types vary from resistance towards all races to susceptibility to them all. Resistance to a given race seems to be governed by a single dominant factor. Breeding work is in progress to try to obtain coffee lines or clones resistant to all races of *H. vastatrix*, by means of intra- and interspecific crosses.

No plants of *Coffea arabica* have been found to be resistant to *H. coffeicola*; resistance in this case must be sought in crosses with other species of *Coffea*, such as *C. racemosa*.

DOTY, MAXWELL S. University of Hawaii, Honolulu, U.S.A. *Classical ecological concepts in population of intertidal recent lava*. Following the population of lava freshly cooled and solidified in the sea has provided an opportunity to follow some of the events in the process of population. It has been determined that the ecological concepts of pioneer colonization, ecesis, pioneer community, seral development, subclimax, climax and disclimax can be recognized. Population changes and species changes associated with each have been recorded. In general it is to be noted that the populations on the historic flows of different data are various, but the populations of prehistoric flows seem to be independent of age.

DU BUY, H. G. and M. W. WOODS, National Institutes of Health, Bethesda, U.S.A. *Segregation of cytoplasmic particles in green plants*. Our studies on segregation of cytoplasmic particles in green plants originated with investigations into the relationships between viruses and host cell components (Phytopathology 31: 978 (1941); *ibid.* 32: 288 (1942); *ibid.* 33: 637 and 766 (1943)). Viruses constitute systems which show self-duplication and mutagenicity following introduction into a susceptible host. Since the nuclear system of the host has not had any previous experience with these viruses, any nuclear control of virus duplication must be permissive. Struck by the similarity of certain virus disease symptoms and certain plastid abnormalities, our studies led us to the conclusion that, among the cellular

constituents, plastids, or in general mitochondria, also possess the properties of self duplication, mutability, etc., as do viruses. Others, following different approaches, have come to more or less similar conclusions (Correns, *Zeitschr. indukt. Abstamm. u. Vererb. lebre* 1: 291 (1909); Imai, *Cytologia, Fujii Jubil.* Vol. 934 (1937); Rhoades, *Proc. Nat. Acad. Sci.* 29:327 (1943) *et multi al*)).

As with viruses, the nuclear control of mitochondrial (or plastid) modification, was considered to be permissive: we demonstrated in *Nepeta* the presence of a mutation-allowing gene (*J. Nat. Cancer Inst.* 11: 1105 (1951)). Presumably prerequisite to the autonomous (chondriogenic) heredity of mitochondria (or plastids) is the presence of ribose nucleic acid, which was found in these structures. Chondriogenes were found to undergo extensive mutation, yielding abnormal mitochondrial derivatives differing widely in form, and in their action on the cell. The spectrum of mutation extends from mitochondria capable of forming nearly normal plastids, through forms yielding strongly modified plastids, to mitochondrial derivatives incapable of developing into plastids. A prerequisite for a direct effect of a mutated nucleoprotein on cell growth and differentiation would be its close relation to relevant cellular enzymes. Our studies of mitochondria, both normal and mutant, have led us to the conclusion that these nucleoprotein containing coacervate particulates carry the enzyme systems necessary for the energetic maintenance of the cell. Many of the mutant forms markedly affect cell growth and differentiation. These mitochondrial derivatives display differing capacities for suppressing the growth of competing mitochondrial types in the same cytoplasm. Environmental factors such as temperature and nutrititon can critically influence this competitive process. It is suggested that continued chondriogene mutation, and intraplasmatic natural selection of the mutant mitochondrial derivatives, could lead to the evolution of ribose nucleic acid-containing viruses.

EGLER, FRANK E. Aton Forest, Norfolk, U.S.A. *Roadside ragweed control knowledge, and its "Communication" between science, industry, and society.* The purpose of this sociologic study is to trace the Communication of a representative sample of botanical knowledge through and among those units of society involved with it. The body of knowledge chosen was purposely one that touches many facets of our culture: roadside ragweed control. The social-units include: the basic scientific knowledge and incomplete derivatives of it; scientists as individuals; industry (chemical manufacturers, vegetation control contractors, business associations, and weed control conferences); government science; government medicine (including air pollution control boards); citizen medicine (professional and lay medical and health units); citizen groups (including professional and lay conservation, agriculture, and sportsmen units); education (universities and museums); the military; and government highway administration. The sample embraced all major social units in: two nations (U.S.A. and Canada), 7 states and provinces, six counties, two cities, and such other units there or elsewhere as became subsequently involved. Except for national units and those known by publications, the sources of data remain anonymous, as this Communications study is not involved with specific

personal or social-unit values and judgments. Over two hundred units were contacted by letter, stating the request of the Ecological Society of America that the author prepare on this subject a review of the literature and its sources, and asking whether the unit had written or sponsored anything, if not which sources they would go to, and which units they would recommend that we contact. Returns were received from over 60%. There was no follow-up except in a few critical instances. Most of the no-replies were small groups that may have considered the request completely outside their field of interest.

Charts have been prepared for each of the geographical areas, showing the actual Communication of the knowledge, or potential Communication (as stated by the unit itself). These charts have been summarized for the major social units. In general, it may be said that the basic scientific knowledge is rarely being communicated to or used by the social units. In lieu, it appears that a body of incomplete and inaccurate knowledge is being widely communicated and recommunicated, even aided by scientists in related fields. Involved in the interpretation of this situation are phenomena relevant to social psychology, especially public relations, motivation, advertising, and simply "the hard sell". Equally involved are phenomena of individual psychology, involving characteristics of the scientist as a type, especially his unawareness of recent developments in these fields, and his own traits as teacher and researcher, together with the intellectual and moral standards associated with those activities.

EGLER, FRANK, E. Aton Forest, Norfolk, U.S.A. *The nature of naturalization*. Phytosociology and vegetation science have been largely oriented towards "natural" undisturbed plant-communities. What is "natural" has been defined in terms of the occurrence of planted or "naturalized" species. The concept of naturalization proves to have highly subjective, arbitrary and emotional bases and biases, related to the actual or supposed influence of man. Some field botanists appear to have a sixth sense in recognizing non-native species. Criteria as to persistence of an individual must consider the long life span of some trees, the growth behavior in our arboreta, and the continuance of the individual in vegetative reproduction. Successive generations of seedlings are indicative in some instances. A suitable site, and its perpetuation, is an essential feature of establishment. Natural hybrids can occur between a native and an alien species, which hybrid can then spread and dominate a local area. Man may introduce in one place what "nature" introduces in another. Other introductions are transfers of what would otherwise occur but for the inconsequential absence of a suitable connecting habitat permitting migration. Other plants may become established or not depending on some obligate symbiont that may or may not be recognized, and itself may or may not be naturalized. The time factor in human history is critical: old civilizations and pre-historic man may have effected both floristic composition and local variations in cover types. In other instances, the influence of man has been to eliminate certain floristic elements. Present re-introductions are therefore "artificial" in a different sense. They may appear to be unsuccessful when what is lacking is the biological micro-environment produced by plants now absent.

The complexity of the issue is such that no simple definition is possible. In the final analysis, it is the judgment of a competent vegetationist as to what plant-communities are natural or semi-natural. Whether or not some of the species are naturalized (in any sense of the term) is an interesting aspect of the study, but such naturalization does not alter the worth of the community for serious study.

EMBERGER, LOUIS. Université de Montpellier, France. *La cartographie des unités de végétation à grande et très grande échelle*. L'auteur présente des cartes phytosociologiques — écologiques et expose les principes et méthodes adoptés par le Service de la Carte des Groupements Végétaux du C.N.R.S. de la France.

EVENARI, MICHAEL. The Hebrew University of Jerusalem, Israel. *The mechanism of breaking dormancy in seeds*. Germination is a sequential chain of physiological processes leading from imbibition to the beginning of growth. There are a number of different alternative pathways along which germination can proceed. Dormancy can either be regarded as a block or blocks established in the course of the different pathways (Toole) or as a strict dependence of each pathway on highly specialised conditions which have to be fulfilled in order to enable germination. According to these definitions which are not mutually exclusive but complementary the difference between "dormant" and "non-dormant" seeds consists either in the number of blocks or in the specificity of germination conditions. Breaking of dormancy then means either destroying or by-passing of the blocks or furnishing the special germination conditions. A study of the means to break dormancy, of the physico-chemical action of these means, and of the times at which these means have to be applied inside the framework of the time-table of germination, provides valuable information on the germination process itself.

An analysis of the influence of alternating temperatures on germination in comparison with the thermo- and photomechanism of germination is used as an example to demonstrate this.

FABRIS, HUMBERTO A. La Plata Museum of Natural History, Argentina. *The genus *Gentianella* in Ecuador*.

FERRI, MARIO G., University of Sao Paulo, Brasil. *Ecological information on the "Rio Negro Caatinga" (Amazon)*. The present paper gives results obtained in Taraquá (0°4'N 68°14'W Gr. alt. 100 m). The vegetation studied is known as "Rio Negro Caatinga". It is an open type of evergreen forest, which occurs in the upper Rio Negro amidst the exuberant Amazonian rain-forest.

The yearly rainfall in the region may be more than 4,000 mm and there is hardly a month with less than 100 mm. Average temperatures and relative humidities are high. Soils are in general very poor.

Detailed information on the vegetation from taxonomical, sociological and anatomical viewpoints, will be presented elsewhere.

The present paper gives data on: degree of stomatic openings of 27 species, from 8.30 a.m. to 5.00 p.m.; daily march of transpiration, velocity of stomatic movements and saturation deficits of 12 species.

The main results are: 1 — No restriction in transpiration was observed in general; 2 — when some restriction occurred, this was followed by a decrease in the size of stomatic openings; 3 — movements of stomates are in general slow; 4 — cuticular transpiration is high; 5 — saturation deficits were not, in general, more than 5% of the maximum water content.

Conclusions: 1 — Water cannot be the limiting factor of the vegetation studied; 2 — anatomical data and water relations of this vegetation are very similar to those found in the Brazilian "cerrado". 3 — The "Rio Negro Caatinga" seems to be, as the "Cerrado"-vegetation, conditioned by soil deficiencies.

GAYRAL, PAULETTE. Université de Rabat, Maroc. *Développement, viviparité, régénération chez la Dictyotacée Spatoglossum Solierii*. Au Maroc *Spatoglossum Solierii* produit en été des tétraspores qui, libérées du thalle, se développent sur le substrat en jeune plantules tout à fait semblables à celles de *Taonia*. En même temps se rencontrent des thalles dont les contenus des sporanges commencent leur développement "in situ"; différents stades de ce développement sont décrits. D'autre part, des thalles ont été observés, porteurs sur leur marge de plantules adventives formées, semble-t-il, à la suite d'un traumatisme; il s'agit d'une régénération due à un grand pouvoir de différenciation des cellules du thalle qui sont susceptibles de donner naissance à des filaments rhizoidaux sur lesquels apparaissent de jeunes lames semblables aux stades avancés des plantules normales.

GRAHAM, B. F.

See BORMANN, F. H. and B. F. GRAHAM

GREIG-SMITH, P. University College of North Wales, Bangor, United Kingdom. *The use of pattern analysis in ecological investigations*. Pattern may be defined as departure from randomness of distribution of species. Presence of pattern within a defined area indicates control of the species concerned by one or few factors or groups of correlated factors. If a large enough area is examined pattern is obvious, corresponding to relatively gross differences in environment. One of the major aims of ecological investigations is to identify the factors determining the performance and occurrence of species. Where pattern is evident, corresponding to a group of correlated factors, it is difficult to determine the importance of the different factors. In homogeneous vegetation the relatively minor differences in environmental factors are much less likely to be correlated with one another and it is possible to identify the effects of individual environmental factors and to separate them from effects of interspecific competition. Pattern of this type may be detected by analysis of variance of amounts of a species in different block sizes in a grid of samples, maxima in a graph of variance against block size corresponding to pattern at corresponding scales. Quantitative data on environmental factors may be analysed in the same way. The use of the method will be illustrated by data relating pattern in an open dune slack to soil level.

GRISDALE, S. K.

See AVADHANI, P. N., S. K. GRISDALE,
R. K. IBRAHIM and G. H. N. TOWERSGUARRERA, SEBASTIAN A. La Plata Museum of Natural History, Argentina.
Algas termales de la Provincia de Salta.

HALFON-MEIRI, ALIZA.

See OPPENHEIMER, H. R. and ALIZA
HALFON-MEIRI

HEASLIP, MARGARET B. Morehead State College, U.S.A. *Radiation sensitivity of deciduous tree seed.* Radiosensitivity of seed collected from eighteen tree species in the Eastern Kentucky Deciduous Forest area varied from species to species, even within a given genus. Several of the possible causes for this sensitivity of the seed to high level gamma irradiation have been investigated. Relative effect of physiological activity and hydration on radiosensitivity of seed of *Quercus alba* L., *Q. velutina* Lamarck, *Liquidambar styraciflua* L., *Cercis canadensis* L., and *Juglans nigra* L. were determined. Seed samples were collected, soaked in water, irradiated, and stratified if necessary to break embryo dormancy before planting. Other seed samples of each of these species except *Quercus alba* L. (no dormancy) were collected, stratified, irradiated at the close of the dormant period, and planted. Water content of seed increases during stratification. Dormant seed was soaked in water before irradiation to ascertain whether water effects were direct or merely indirect effects on physiological activity. Increased physiological activity does increase the sensitivity of these species to irradiation. Increased water content does not increase the radiosensitivity of the seed with dormant embryos. This is evidence that hydration has indirect effects upon radiosensitivity.

HEIBERG, SVEND O. and ALBERT L. LEAF. New York State University, Syracuse, U.S.A. *Effect of forest debris on the amelioration of sandy soils.* Organic matter additions to a deep sandy outwash soil (Hinckley series) deficient in potassium at the Charles Lathrop Pack Demonstration Forest in the southeastern Adirondack Region of New York State were applied 15 to 25 years ago in the form of humus and slash.

This report compares the growth of plantations of *Pinus resinosa* Ait., *Pinus strobus* L., *Picea glauca* (Moench.) Voss., and *Picea abies* (L.) Karst. on treated and untreated soils, and the effect on the composition of the soil and foliage. The source of the slash and humus, i.e. from a highly productive or a depleted site, as well as the tree species composition, affects the value of the organic matter as an ameliorating agent. Growth of *Pinus resinosa* on a glass wool mulch plot indicated that the increased fertility due to the organic additions greatly exceeded the mulching value.

HEJNOWICZ, Z. University of Wroclaw, Poland. *Eversporting periclinal chimeras.* The author has reported the existence of peculiar chimeras in some variegated forms of Cupressaceae. Their green shoots are haplochlamydal periclinal chimeras. Besides the green shoots there are numerous

“white” (non-chimerical) or sectorial “green-and-white” (mericlinal) shoots. They take their origin from the apices which previously produced green shoots, being “sports” of the outer chlorophyll deficient component. Examination of shoot apices shows that there is a surface layer of cells, like a tunica, which divide anticlinally and also periclinally from time to time just at the summit. A stratified like tunica-corpus pattern make the existence of periclinal chimera possible while periclinal divisions in apical initials explain the formation of mericlinal or non-chimerical shoots. The plant does not lose its chimerical character because from each chimerical shoot arise new chimerical branches before its apex will be formed solely from the outer component. Handing down the chimerical state from the shoot to its branches is possible due to the fact that during the formation of axillary buds the cells in the surface layer divide only anticlinally. It is therefore evident that the existence of such chimeras is strictly related with: 1) unstable tunica-corpus pattern of shoot apices, 2) shrubby manner of branching, 3) tunica-corpus pattern of developing axillary buds. These characters allow for distinguishing a new group of chimeras mentioned in the title. These chimeras on the background of the general problem of chimera and of apex growth are discussed.

HELLER, RENE. Université de Paris, France. *Chélation et alimentation en fer des cultures de tissus végétaux*. Les tissus étudiés sont des tissus de Carotte cultivés sur milieu gélosé (méthode de GAUTHERET) ou liquide (technique personnelle).

1) La carence en fer s'obtient sans difficulté par 2 ou 3 passages de 2 mois chacun sur une solution nutritive sans fer sur ajouté; par contre, un seul apport initial de sel ferrique à pH: 6 au début de chaque passage (par exemple FeCl_3 , $6 \text{ H}_2\text{O} : 10^{-6} \text{ g/cm}^3$) assure une alimentation normale.

2) L'acide éthylène-diamine-tétracétique (E.D.T.A.) est sans action ou, au delà de 10^{-5} g/cm^3 , toxique sur milieu gélosé; de même sur milieu liquide lorsque la croissance est mauvaise; mais, si sur milieu liquide, la prolifération est bonne, il y a stimulation vers 10^{-7} ou 10^{-8} g/cm^3 , sans doute parce que l'E.D.T.A. rétablit l'équilibre alimentation croissance.

L'emploi de fer radioactif met en évidence le rôle considérable de l'E.D.T.A. sur le maintien du fer en solution, même aux pH peu acides.

L'E.D.T.A. favorise l'absorption du fer par les tissus, indépendamment de son action indirecte sur leur croissance.

3) Les tissus végétaux excrètent dans la solution nutritive un produit (sans doute un chélateur) qui maintient le fer en solution: ainsi s'explique la différence de comportement entre les racines et les tissus isolés quant aux exigences à l'égard du fer.

HILL, GEOFFREY P. Harvard Forest, Petersham, U.S.A. *Sieve tube/storage cell relations revealed by the aphid technique*. Experiments with *Salix* using the aphid technique indicate that when solute supplies from the leaf to the sieve tube are cut off the storage cells immediately take over the function of supplying them. This is supported by the fact that exudation

can be obtained from lengths of stem and strips of bark as well as from whole plants. Experiments using solutions in contact with the bark indicate a high resistance of sieve tubes to plasmolysis, which must be important in maintaining translocation when high water tensions are present in the xylem.

HOWARD-FLANDERS, P. Medical Research Council Experimental Radiopathology Research Unit, Hammersmith Hospital, London, United Kingdom. *Chemical factors in radiation injury to micro-organisms*. Certain substances are effective in modifying radiation injury, including radiation-induced mutation. Oxygen is almost universally active as a radiosensitizing agent. Nitric oxide is also very active in increasing the radiosensitivity of vegetative bacteria and a number of other organisms, although one interesting exception has been reported. Cysteamine is active in inducing anoxia and may thereby protect, but is without effect on the radiosensitivity of bacteria if either anoxic or fully oxygenated during irradiation, even though little cysteamine is oxidized in this procedure. Cysteamine does, however, protect anoxic bacteriophage suspended in concentrated nutrient broth. Oxygen greatly reduces this effect, although it does not otherwise sensitize the free phage to radiation. Oxygen also doubles the radiosensitivity of the phage-bacterium complex, whether cysteamine is present or not. These findings are discussed in relation to a simple mechanism of radiation action on cells.

HUBER, B. Forstbotanisches Institut, München, Deutschland. *Central European studies with special reference to CO₂ gradients*. After a short review of the development of experimental ecology in Germany since the first world war, the author will present hitherto unpublished results on CO₂ gradients in forests, recorded with the help of an infrared recorder. During the day (light) the level of minimum CO₂ content lies in the middle or lower parts of the crowns. The upper parts get CO₂ from the open air, the lower parts from soil respiration. This result is confirmed by radiocarbon determinations.

HUBER, B. Forstbotanisches Institut, München, Deutschland. *Long distance translocation in living tissues. Introduction*. As Miss Esau is not able to attend the Congress, the chairman of the symposium will give some introductory remarks on the anatomical bases of long distance translocation. There is agreement that long distance translocation takes place in the sieve cells or sieve tubes. The uncertainty begins with the role of the sieve plates (obstacle or promotor of movement?). Further points of discussion are the chemical composition of sieve tube sap (much progress has been made in recent years) and the mechanisms of movement (diffusion-like processes or mass movement). The speaker recommends division of the problem into smaller problems which can be solved more easily.

HUGHES, R. ELFYN. The Nature Conservancy, Bangor, United Kingdom. *Soils and vegetation in Snowdonia (N. Wales)*.

HULTEN, ERIC. The Swedish Museum of Natural History, Stockholm, Sweden. *Ranges of circumpolar arctic — montane plants*. The major distributional types of circumpolar arctic — montane plants and those that are transitional to the boreal group are discussed. Some are essentially arctic with a single or few stations southward, others have a number of isolated areas in the mountains to the south, and still others have a wide range in the southern mountainous regions which may or may not be connected with their Arctic range. Many Arctic — montane species when mapped in detail have ranges with a more or less continuous arctic ring around the North Pole and another concentric but broken ring in the southern mountains. The significance of these distributions are discussed in relation to the ice-free and glaciated areas during the Pleistocene.

An increasing knowledge of the ranges and races especially of those species that have a worldwide distribution will furnish us with valuable material from which facts can be gained concerning the history and development of the flora and vegetation during the Quaternary period.

IBRAHIM, R. K.

See AVADHANI, P. N., S. K. GRISDALE,
R. K. IBRAHIM and G. H. N. TOWERS

JIMENEZ, JOSE de Js. Santiago de los Caballeros, Republica Dominica. *A new catalogue of the Dominican flora*. When Moscoso's *Catalogus Florae Domingensis* was published in 1943, it was thought that very little could be added to this monumental work. Recent collections, among which stand out those of Allard, Howard, the staff of the Instituto Botanico de la Universidad de Santo Domingo and my own in the Dominican Republic, as well as Proctor's and others' in Haiti, have yielded numerous species, either new to science or to the country. Recent studies and revisions of different taxonomic groups have also shown a number of errors in scientific binomials, the making of several species and genera out of a single one; new families (*Picrodendraceae*); revival of older binomials according to priority; new combinations, transfers, etc. Moreover, Ekman's and many collections of others have now been thoroughly studied so that many novelties have come out of them.

The above mentioned reasons urged evidently the preparation of a Supplement to the *Catalogus*. This is what I have tried to do with the help of outstanding botanical authorities who have kindly given me invaluable advice.

In the Supplement I have gathered 933 species, distributed in 401 genera, not mentioned in Moscoso's work. Out of the 933 species, 244 transfers must be deducted. The rest (689 spp.) represents the number to be added to the 5058 spp. in Moscoso's *Catalogus*. Thus, we have now in our flora 5747 known species.

In my work an endemism of 21.63% occurs (149 endemic species out of 689 spp.). Moscoso indicated an endemism of 38.87% (1966 endemic species out of 5058 spp.). Summing up Moscoso's endemism with mine, the total turns out to be 36.80% (2115 endemics out of 5747 recorded species). The exotic species amount up to 158 species in the Supplement. Moscoso recorded 420 introduced ones. Thus, the actual total is 578 ones.

I have made 39 new combinations and propose 4 new species. At the end of the Supplement, I give a very extensive list of common names gathered in my botanical trips not recorded in Moscoso's *Catalogus*.

JONES, LAURENCE S. Entomology Research Division, U.S. Dept. of Agriculture, Riverside, U.S.A. *Control of vectors of plant viruses*. The control of insect, mite or other vectors of plant viruses is a different and more complex assignment than to control such species as ordinary pests. In many instances the vector species do not inflict much or any damage upon their hosts except to introduce the viruses, and measures to effect their control must be shown profitable in terms of reduced disease. Such data are more difficult to obtain than those needing only to show reductions in densities of populations. Each virus-vector relationship is a unique problem. Different situations are presented particularly with vectors of viruses of perennial plants as compared with those infecting annual crops.

Control measures are being applied against numerous vectors, some with substantiated effectiveness and value. Possibly enough successes have been obtained to overcome opinions that research in vector control is the least productive approach to meeting any virus control method, however, is apparent. A review of those instances in which vector control has been of value, and those in which it has not, reveals some principles apparently influencing success.

KOK, BESSEL. Research Institute for Advanced Studies, Baltimore, U.S.A. *Does photosynthesis require the interaction of two photochemical steps?*² Based directly on recent difference spectoscopic data and indirectly on various other observations, a hypothesis will be discussed which conceives a cycle of two photochemical acts in photosynthesis.

Indicative of these two steps are the formation and disappearance of an absorption band around 700 m μ . Both effects are photo-induced, but the activation spectra are different.

In *Anacystis*, light absorbed by chlorophyll-*a* or transferred to it causes breakdown; in the restoration of the 700 m μ pigment only light absorbed by phycocyanin is active.

It looks as if the breakdown is a direct photochemical process whereas the restoration, though photo-induced, requires intermediate dark steps.

KRAUSS, ROBERT W. and CONSTANTINE SOROKIN, University of Maryland, College Park, U.S.A. *Metabolic pathways and growth of algae*. The culture of algae in chemically defined media employing various combinations of inorganic salts, organic carbon, chelating agents, vitamins, and amino acids has progressed to the point where culture of all but the most fastidious is routine. Adjustments of the components of culture apparatus have made it possible to force algae to maximum growth rates. Current experiments deal with the reasons for specific culture requirements. Examination of different species or strains of *Chlorella* at the enzyme level has shown that some possess alternative pathways for sugar assimilation which make possible survival and growth under stress. Studies with

synchronized cultures have shown changes in cellular metabolism at different ages. Maximum growth rates of steady state cultures are the result of a compromise among the different optimum conditions for the cells at different stages of growth. The inhibiting effect of light on cell division conflicting with the requirement for photosynthesis is pertinent. A more intimate knowledge of the metabolic alternatives within the algae will increase the understanding of their cultural and ecological requirements.

KUPRIANOVA, L.A. Komarov Botanical Institute, Leningrad, USSR. *The progress of palynology in the U.S.S.R. during the period 1955-1959.*

1. The rapid increase in the number of palynological laboratories and of workers in Palynology is indicative of the progress of Palynology in the U.S.S.R. In 1953 there were 70 pollen-analysis laboratories and 350 palynologists. In 1959 there are over 150 laboratories, whereas the number of palynologists has increased to 1000.
2. The services of palynologists are especially great in the solution of stratigraphical problems (from the Upper Proterozoic to the Quaternary deposits inclusive). A great deal of material has been collected from the regions that had hitherto been "white spots" from the standpoint of Palaeobotany (from many regions of the Arctic, of the Soviet Far East, of Middle Asia and from certain other areas.).
3. During these years palynologists have found many new species that had not been known to palaeobotanists from the territory of the U.S.S.R.
4. The great number of the palynological finds from the different localities of the U.S.S.R. has made it possible to draw a number of conclusions on the History of the Flora.
5. The conferences on the history of the Quaternary period, in particular, on the problem of glaciation have been held during this period; palynologists have taken an important part in these conferences.
6. A tendency is observed toward the use of a more detailed floristical analysis and to the accumulation of the proper documentation.
7. The indispensability of special sporothekes for the preparations of pollen and spores is fully realized. Seven large sporothekes are founded, their total number thus exceeding 40.
8. The palynologists of the Soviet Union are united in the Palynological Committee of the Botanical Society of the U.S.S.R., where they meet for the discussion of problems of Palynology and current affairs. A symposium "Palynology and Palaeobotany" has been published by this Committee in cooperation with the Palaeobotanical Section of the Society. Many palynologists, working mainly in stratigraphy, are united in the Palaeobotanical Committee of the Botanical Society of the U.S.S.R.
9. About 500 works in Palynology have been published during the last five years. They are registered in a special bibliography.

LATIMER, PAUL and JOSEPH A. McCLURE. Vanderbilt University, Nashville, U.S.A. *Light scattering by cell suspensions*. Spectral curves of light transmitted or scattered at certain angles have revealed several light scattering phenomena. In general, if light coming from a cell suspension (algal cells, erythrocytes, or chloroplasts) at a specified angle to the incident beam is compared with the incident light itself, the resulting spectral curve has sharp peaks and valleys. Only in special cases, however, do the positions of the peaks and valleys correspond to the absorption characteristics of the biological cells. Band maxima may appear at positions $15\text{ m}\mu$ or more removed (on either side) from the actual absorption maximum. The experimental conditions which control these positions include the viewing angle of the light detector, the refractive index of the medium, the concentration of the suspension, and the shape of the cells.

Many of the observed optical phenomena are predicted by light scattering theory. Nearly quantitative agreement is obtained between some experimental and theoretical curves.

LAVOIE, VICTORIN. Institut botanique, Université de Montréal, Canada. *Influence atlantique sur la végétation de la Sierra de Guadarrama*. Au centre de la Meseta espagnole, se dresse la Cordillère centrale séparant la Vieille Castille de la Nouvelle Castille. La Sierra de Guadarrama, faisant partie de ce système, a une longueur d'environ 80 kilomètres et s'élève à une altitude allant jusqu'à 2400 mètres (Penalara) au-dessus du niveau de la mer. D'origine cambrienne, ses formations de granit et de gneiss ont contribué au développement de sols du type Ranker et de terre brune centre-européenne.

Les conditions climatiques de la région environnante sont celles du régime méditerranéen aux étés chauds et secs, aux hivers frais et humides. Ces conditions changent avec l'augmentation de l'altitude: en plus du refroidissement dû à la raréfaction de l'air, des courants atmosphériques de l'Atlantique viennent rencontrer les montagnes de la Sierra et déposent la vapeur d'eau condensée. Ce phénomène se produit entre 1200 et 1500 mètres d'altitude environ. Au-dessus de 1500 mètres règnent des conditions plus xériques.

Floristiquement, la zone à caractère océanique se rattache aux éléments des forêts de chênes à feuilles décidues. Leur représentant ibérique qui, semble-t-il, appartient au climax, est *Quercus pyrenaica*.

Pour la classification de la végétation, j'ai suivi les méthodes et la nomenclature phytosociologiques de l'école de Zürich-Montpellier. Les peuplements de chêne Tauzin de la Sierra de Guadarrama se rattachent au QUERCION OCCIDENTALE (Br. Bl. et Al. 1956) qui se retrouve surtout en Galicie, au Portugal septentrional et moyen. A cause de sa situation géographique, la Sierra comprend dans sa flore des éléments du QUERCETO-FAGETEA qui deviennent caractéristiques territoriales de l'alliance. Une association, QUERCETUM PYRENAICAE (Rivas 1954), est reconnue dont la prédominance est donnée aux nanophanérophytes par suite de son contact intime avec les landes. Ces landes qui succèdent à la végétation climacique sont soit d'origine méditerranéenne (CISTION LAURIFOLII, Rivas 1955), soit d'origine atlantique (ERICION UMBEL-

LATAE, Br. Bl. et Al. 1952). Des groupements thérophytiques forment le stade pionnier; ils appartiennent au FESTUCO-SEDETEA (Br. Bl. et Tx. 1943), Ober. 1957.

LEAF, ALBERT L.

See HEIBERG, SVEND O. and ALBERT L. LEAF

LE KIEM NGOC. Laboratoire du Phytotron, Gif-sur-Yvette, France. *Nouvelles recherches sur la vernalisation d'une plante vivace, le Geum urbanum*. Nous avons montré antérieurement que la plupart des *Geum* et notamment le *Geum urbanum*, exigent absolument, pour pouvoir fleurir une action préalable du froid (environ 6 à 10 semaines), qui constitue une véritable vernalisation. Ensuite la plante est indifférente au photopériodisme. Elle demeure vivace parce que la bourgeon terminal et les bourgeons axillaires déjà bien développés paraissent insensibles à l'action vernalisante du froid.

De nouvelles recherches viennent de montrer qu'une action prolongée du froid (de l'ordre d'un an à $+ 3^{\circ}\text{C}$) réussit à vaincre l'inaptitude de ces bourgeons à percevoir la vernalisation.

On peut parvenir plus aisément au même résultat par des applications combinées de gibbérelline avec des durées plus courtes de froid (par exemple 12 à 13 semaines). La gibbérelline seule produit des phénomènes d'élongation temporaire mais non de floraison.

L'action vernalisante du froid est donc complexe et une partie seulement de cette action peut-ici être remplacée par la gibbérelline. De plus les propriétés qui maintiennent normalement l'état vivace malgré la vernalisation peuvent être abolies ou modifiées par des doses anormales de froid ou de combinaisons de froid et de gibbérelline.

LEONARD, JUSTIN W. Michigan Department of Conservation, Lansing, U.S.A. *The role of herbicides in wildlife management*. Many governmental agencies are responsible for the management of renewable natural resources on extensive areas of publicly-owned lands. Principal resources involved are forests, fish, and game birds and mammals. In such programs the dominating concept is that of multiple use. Herbicides offer the advantage of a considerable degree of selectivity in manipulation of vegetation at a lower per-acre cost than is presently possible through conventional mechanical methods.

Herbicidal control of aquatic vegetation can contribute to fishery management (1) by favoring microscopic algae at the expense of submerged higher plants; (2) by eradication of submerged vegetation thereby exposing small fish to more efficient predation, with results beneficial to the fishery as a whole; and (3) by removal of vegetation which interferes with boats, propellers, and fishing tackle.

In game management herbicides may be used (1) to create and maintain openings in both woody growth and dense sod cover; (2) to eliminate undesirable aquatic vegetation or to change plant succession in shallow waters and marshy areas; and (3) to encourage sprouting of food and cover species.

Further research is needed to develop herbicides and methods having better predictability of results than those now available.

LEVITT, J. University of Missouri, Columbia, U.S.A. *The influence of dehydration on the cytoplasm and the bound water theory.* Dehydration of cytoplasm may be produced by loss of water in the vapor, liquid or solid state. The effects on the cytoplasm include certain similarities as well as differences. These involve a) instantaneous changes in the physical properties b) rapid injurious effects, and c) gradual adaptive changes.

The bound water theory has led to confusion due to an inexact usage of the term — e.g. osmotically and colloidally bound water do not refer to different kinds of water but to different methods of producing the same decrease in activity of the water. The importance of developing methods for measuring the two independently is in finding out how cytoplasm is able to undergo the gradual adaptive changes associated with dehydration.

The application of these principles to the problems of drought and frost tolerance in plants will be discussed.

LEWIN, JOYCE C. Woods Hole Oceanographic Institution, U.S.A. *Silicon as an essential element for diatom cultures.* Since diatoms make their walls of silica, they are only able to divide and form new walls if a soluble silicon compound is available in the nutrient medium. Only unpolymerized silicic acid can serve as a source of silicon. Experimental studies with *Navicula pelliculosa* have shown that no other chemically related element, such as germanium, phosphorus, or arsenic, is able to replace this requirement for silicon, nor can those elements of similar atomic radius, such as aluminum, magnesium, or iron.

Silicon is only taken up by diatom cells using respiratory energy under aerobic conditions, when sulfhydryl groups on the cell surface membrane are in the reduced state, and when calcium is present. The requirement for large amounts of calcium for diatom growth, generally observed in ecological as well as physiological studies, may be correlated with the necessity of this cation for silicon uptake. Likewise, the stimulation of diatom growth, occasionally observed in nature and in culture by reducing compounds such as sulfide, may also be connected with the reducing conditions needed for silica deposition.

The thickness of the silica wall can vary depending on the amount of silicon present in the nutrient solution and on the rate of cell division. Cultures of synchronously dividing cells take up silicic acid at a constant rate irrespective of the stage in the cell division cycle. When growth is limited by some nutrient other than silicon, silicon uptake continues for some time, with a consequent thickening of the wall.

LIETH, H. Botanisches Institut der Landwirtschaftlichen, Hochschule Hohenheim, Stuttgart-Hohenheim, Germany. *A simple method for measuring the light compensation point.*

MACHADO,* R. D. and K. R. PORTER. The Rockefeller Institute, New York, U.S.A. *Fine structure of the cells in root tip of Allium cepa L.* Various cell types of the onion root tip have been examined by electron microscopy after fixation with OsO_4 and with KMnO_4 . In this analysis of fine structure special attention has been given to the form and distribution of membrane-limited elements of the cytoplasm which are interpreted collectively as equivalents of the endoplasmic reticulum of animal cells. The prominent unit of structure is sheet-like in form and is made up of two membranes separated by a thin space. The total thickness varies between $30 \text{ m}\mu$ and $50 \text{ m}\mu$. The other dimensions of these units are difficult to determine but may equal the length or breadth of the cell, i.e., several microns. It seems proper to equate these structures to the cisternal elements of the equivalent animal cell system. As in the animal cell, they occur frequently in parallel arrays and oriented roughly parallel to the lateral walls of the cell. Such parallel units show interconnections making of the array a continuous "reticular" system. Connections between these lamellar units and the nuclear envelope are common. Where they enter the cortex of the cell, just beneath the plasma membrane, they become more finely divided and the resulting tubular elements associate morphologically with the plasmadesmata. A similar phenomenon occurs during cell plate and early wall formation. Micrographs and models will be shown to illustrate these and other aspects of fine structure.

* Fellow of the Rockefeller Foundation from Instituto de Oleos, Rio de Janeiro, Brazil.

McCLURE, JOSEPH A. See LATIMER, PAUL and JOSEPH A. McCLURE

MOREL, GEORGES M. Station Centrale de Physiologie Végétale de l'I.N.R.A., Versailles, France. *L'anergie des tissus végétaux à l'auxine.* Après de longues périodes de culture *in-vitro* les tissus végétaux subissent fréquemment de profondes modifications de leurs propriétés physiologiques. Une des plus surprenantes est l'acquisition de la propriété de synthétiser de fortes quantités d'auxine et de se développer indéfiniment sans substances de croissance, modification désignée sous le nom d'accoutumande ou d'anergie à l'auxine.

Nous décrivons les conditions d'apparition de ce phénomène, les modifications qu'il apporte aux tissus et discutons la nature de ces transformations.

MUNOZ, CARLOS. University of Chile, Santiago, Chile. *A synopsis of the Chilean flora.* In Chile, there are two important classical works to introduce the students of Botany to the flora of the country. The first one is Gay, *Historia Fisica y Politica de Chile* (1845-1852); the second Reiche, *Estudios Criticos sobre la Flora de Chile* (1896-1911). Since these two works have appeared and although a number of papers have been published on the matter, there is an entire lack of information regarding the flora of the country as a whole.

The author will present a summary of his new work, entitled *Sinopsis de la Flora Chilena*, which is an introduction to the Chilean flora with keys to families and genera. It comprises 181 families and 950 genera from ferns to grasses, a good many of them not mentioned before for Chile. The work has been planned to follow in part Hutchinson's system, but the arrangement of the families is by alphabetical order. For each family a good number of the most important species are cited and new vernacular names are mentioned. It contains approximately 1300 drawings distributed on 250 full page plates by Sierra and Sudsuki. Prologue by Carl Skottsberg.

MYERS, JACK. Carnegie Institution of Washington, Stanford and University of Texas, Austin, U.S.A. *Evidences for a specific participation of chlorophyll b in photosynthesis*. Rate of oxygen evolution in photosynthesis was measured as the current from a platinum electrode covered by a layer of *Chlorella* cells about 15 microns thick. The arrangement gave a reproducible measurable rate of photosynthesis proportional to light intensity at the low levels used and gave rapid response to changes in illumination. Three phenomena have been explored. (1) The Emerson effect was studied as enhancement of photosynthesis in long wavelength red light ($700m\mu$) when shorter wavelengths were added. (2) Large and reproducible transients in oxygen evolution were observed accompanying change in illumination between two wavelengths adjusted in intensity to support equal steady rates of photosynthesis. (3) Differences in the time course of photosynthesis were found to be wavelength-dependent. The three phenomena have identical action spectra which are interpreted as demonstrating a specific photochemical participation of chlorophyll *b* in photosynthesis.

MYERS, JACK. University of Texas, Austin, U.S.A. *Steady-state cultures of algae*. Steady-state cultures of algae are useful whenever it is desirable to measure or to hold constant the specific growth rate. They are more important for algae than for other microorganisms because of the light requirement and the mutual shading of cells which accompanies growth.

There are two principles upon which steady-state cultures may be devised. The first is a controlled-dilution method in which rate of dilution by fresh medium is controlled by a photometric device to keep cell concentration constant. The culture then may be held at constant volume, which is preferable for study of algal growth *per se*, or may be managed at variable volume for production of experimental material. A second principle of nutrient or light limitation makes possible a second kind of steady-state culture, the chemostat, which uses a constant-dilution, constant volume arrangement. A specific dilution rate less than the specific growth rate allows development of light or nutrient-limited steady-state in which cell concentration becomes constant.

It is evident from applications already made that the technology of steady-state culture is sufficiently developed to allow more general use for problems in algal physiology.

NIERING, WILLIAM A. Connecticut College, New London, U.S.A. *The role of herbicides in vegetation management. Introduction*. Herbicides

are currently finding practical application in many fields of vegetation management. This symposium will review their role in forest, wildlife and right-of-way management, as well as the sociological implications inherent in certain aspects of the problem.

With the introduction 15 years ago of hormone-like chemicals such as 2,4-dichlorophenoxyacetic acid (2,4-D) and 2,4,5-trichlorophenoxyacetic acid (2,4,5-T) we entered a new era from the standpoint of available techniques for manipulating or controlling vegetation. In forest management, competitive weed species could now be permanently eliminated (root killed) with no further resurgence — a perpetual problem when hand cutting was employed. In wildlife management herbicides are invaluable in creating forest openings, as well as in maintaining habitats at a certain successional stage for maximum wildlife benefits. On rights-of-way they are being extensively used to control undesirable woody vegetation.

Techniques of application vary considerably. However, two general methods are widely employed — the selective approach which aims at treating only those species not wanted and indiscriminate broadcast sprays in which all vegetative cover is treated. Although the latter method is useful in certain types of management it has been this indiscriminate application that has aroused considerable public concern regarding the use of weed killers.

This introduces the sociological aspects of the problem which will be concerned with the integration of current scientific knowledge on the use of chemicals into industry and society as a whole. One of the major problems is that persons directing their application frequently lack the basic knowledge needed for their most efficient use on a long-range basis. Properly used they can result in greater economy and simultaneously provide maximum conservation benefits.

ODUM, EUGENE P. and WILLIAM K. WILLARD. Ecological Studies, AEC Savannah River Plant, University of Georgia, U.S.A. *The fate of radioisotopes introduced into pioneer vegetation*. From the standpoint of community metabolism a comparison is made between short-lived isotopes and low-level wastes containing long-lived fission products introduced into early seral stages of vegetation. Radioactivity on an area basis in insect and bird populations appears to provide a good measure of that portion of plant uptake which is transferable to heterotrophic levels in natural communities. A method is described whereby specific food chains may be isolated and studied in rapidly changing communities. Short-lived radionuclides have been most useful as population "tags", while the dispersion of long-lived radionuclides is the result of the integration of populations and trophic levels in the functioning of the ecosystem. Only a very small portion of the total amount of such fission products as Sr^{90} introduced into natural terrestrial vegetation reaches the end of the food chain; however, the increase in specific activity is such that tissue levels in some wild birds on the area contaminated with low-level wastes proved to be greater than the present "minimal permissible level" for man.

O'HERN, ELIZABETH M. State University of New York College of Medicine, Brooklyn, U.S.A. *An electron microscopic study of the development of hyphae and sporangia in Mucor corymbifer*. Electron micrographs of day old cultures of *Mucor* reveal large vacuoles in the growing hyphal tips; finely granular, homogeneous material fill the vacuoles. Mitochondria are frequently found in advance of the vacuole at the tip while nuclei, often in pairs of clusters, usually follow the vacuole. The cell walls of hyphae from such cultures are thin and dense to the electron beam and the cytoplasmic membrane is smooth. In cultures two or three days old most hyphal walls are thickened and have lost their electron density; the cytoplasmic membrane is often convoluted. Sporangia develop from club-tipped hyphae where nuclei accumulate. The walls of the sporangiophore and of the developing sporangium thicken and clear vacuoles form within the sporangial matrix prior to the appearance of cleavage furrows. With the development of the columella and the gradual enlargement of the sporangium, the sporangial wall becomes progressively thinner, until at maturity it is again a thin, dense membrane. Cleavage furrows appear to result from the apposition of the external surface of the cytoplasmic membrane between which wall material is laid down.

OPPENHEIMER, H. R. and ALIZA HALFON-MEIRI. The Hebrew University, Rehovot, Israel. *Studies on the influence of different soils on growth and chemical composition of mediterranean forest trees*. Both Aleppo pine and Valonea oak (*Quercus ithaburensis*) occur in Palestine under extremely varying soil conditions. Completing his study of the former, the senior author found a far-reaching stability of Ca, K, Mg and P percentages in needles. Very high soil calcium raised, however, needle-Ca by 10 to 40%, depressing K somewhat.

Leaf composition of *Quercus ithaburensis* thoroughly investigated by the junior author in natural association and containers, also proved little influenced by soil, except its Ca and K. Leaf calcium, higher than in oaks of the cool-temperature zone, here rises with increasing Ca-carbonate and exchangeable calcium of the soil while leaf potassium is positively correlated not to total soil-K, but to the share of exchangeable K in total exchangeable bases. Ca and K action and interaction is apparently the main modifying factor in ash composition otherwise produced by genetic factors. Normally the oaks were decidedly higher in Ca and Mg than the pines, but rather lower in K and P. First two years' development was little influenced by soil in both species but very sandy and high limestone soils depressed growth more or less. Some admixture of loam thus seems necessary for the obtaining of best results. Oak roots branched out much less in heavier than in sandy soils (renzina, basaltic soil). Oaks sending their roots into solid limestone rock, precipitated ample Ca-oxalate in the central vein of their leaves.

PALUMBO, RALPH F. University of Washington, Seattle, U.S.A. *The differences in uptake of radioisotopes by marine and terrestrial organisms*. The factors which operate to make radioactive fallout isotopes available for uptake by land and marine organism are discussed. In the sea the

factors of major importance are (1) the size of the fallout particles, (2) the solubility of the element, (3) the absorption of the element to organic and inorganic materials, (4) isotopic dilution by the stable form of the element, and (5) the coprecipitation of the element with chemically similar elements. The factors of major importance in determining the uptake of the radioelements by land plants are (1) the solubility of the element, (2) the effect of other elements in the soil, (3) the type of soil, (4) the downward movement of the element through the soil, and (5) the growth habit of the plant. The concentration of the radioactive elements by animals is dependent upon the radioisotopic composition of the food. The evidence that has been accumulating over the years shows that the radioactive isotopes which occur in the particulate form and those that form strong complexes with organic matter are the ones that are taken up in highest amounts by the marine organisms. These radioactive elements include the fission products Ce^{144} , Pr^{144} , Zr^{95} - Nb^{95} , and Ru^{106} - Rh^{106} , and the non-fission products $\text{Co}^{57, 58, 60}$, $\text{Fe}^{55, 59}$, Zn^{65} and Mn^{54} . The land plants and animals, however, concentrate the soluble fission products such as Cs^{137} and Sr^{90} .

PARKER, A. K. Forest Biology Laboratory, Canada Department of Agriculture, Victoria, Canada. *Bark moisture relations in disease development — present status and future needs*. Demonstration of a negative correlation between the development of infection caused by seasonal parasites and moisture content of the host has now been made for a number of canker diseases. The more widespread use of bark moisture content in terms of relative turgidity values promises to offer an index by which "physiological weakening" and the effects of complex ecological factors may be measured and comparisons made by different investigators studying diseases of this type. The nature of the correlation between disease development and moisture content is discussed, with particular reference to the formation of periderm and anatomical characteristics favoring water economy. Mention is made of control measures that may be applied now, and practical considerations that may arise from further studies are discussed.

PATAU, KLAUS and NIRMAL K. DAS. University of Wisconsin, Madison, U.S.A. *Induced cell reproduction in differentiated tissue*. When tobacco pith was taken into culture on modified White's medium, DNA doubling occurred in some nuclei (Feulgen microspectrophotometry, autoradiographs: tritiated thymidine). Their frequency was increased by added kinetin. The addition of IAA alone not only increased the incidence of DNA doubling but also initiated some mitoses (completely absent without IAA) and, for a very limited time, cytokineses. Only when kinetin and IAA were used together did DNA doublings and mitoses with subsequent cytokinesis continue to occur at a relatively high rate. DNA synthesis was found in the tissue before the appearance of mitoses, yet only about 50% of these first mitotic nuclei had undergone DNA synthesis in culture. After 16 days there were still nuclei entering mitosis that had not synthesized DNA since the beginning of culture. Nuclei with the DNA content 4C reacted thus on the treatment in two ways: some entered a diploid mitosis,

others first doubled their DNA content and then underwent a tetraploid mitosis. Therefore, the terms 'diploid' and 'tetraploid' are meaningless when applied to 4C interphase nuclei in differentiated tissue. Repeated divisions, leading to patches of meristematic cells, seemed to occur only in cells with diploid mitoses.

PATTON, R. H.

See RIKER, A. J. and R. H. PATTON

PLATT, ROBERT B. Emory University, U.S.A. *Critical review of micro-environment as a field of research.* The concept of particular environment (microenvironment), as compared to general environment, is reviewed from its beginning during World War II on to its present time. Highlights are given of the development of environmental science in such fields as the utilization and care of military goods and equipment, architecture and construction, meteorology, public health, special areas relating to conquest of space and the atomic age, and finally the spectrum of biological sciences particularly physiology, genetics, taxonomy and evolution and the applied areas of forestry and agriculture. An attempt is made to encompass, within a few broad generalizations, the results of the past fifteen years of intensive study of microenvironment. In conclusion, the demands and responsibilities for the future are projected.

PLATT, ROBERT B. Emory University, U.S.A. *Radiation ecology studies at Emory University.* A description is given of the research facilities provided through a cobalt field constructed on the campus of Emory University, and a radiation field provided in a remote wooded section in North Georgia by a partially shielded reactor put up under the joint auspices of the United States Air Force and Lockheed Air Craft Corporation. A brief description follows of the several projects which provide support for the program. The primary part of the presentation will then be concerned with a description of the several basic projects concerned with background activity and radiation dosage, the production, transfer, and accumulation of isotopes in nature, and the long range effects of radiation on selected environments. The latter part includes special projects on plants and animals and soils.

PLATT, ROBERT B. Emory University, U.S.A. *Studies in radiation ecology.* By means of models, charts, diagrams, and photographs, special facilities for radiation ecology research will be presented. The basic facilities are (1) a relatively unshielded atomic reactor in a natural environment (constructed by Lockheed Aircraft Corporation and the U.S. Air Force) and (2) a gamma field (cobalt) for controlled studies (built by Emory University).

PORTER, KEITH R. The Rockefeller Institute, New York, U.S.A. *Structure of cytoplasm.* The cytoplasm of plant cells, exemplified largely by cells of onion root tips, show membrane-limited systems similar in several respects to those encountered in animal cells. There are, e.g., close aggregations of thin vesicles, commonly referred to as dictyosomes, which resemble the

Golgi component found elsewhere. There is also an extensive system of membrane-limited lamellar units which, in several morphological features, is equivalent to the endoplasmic reticulum of other cells. Special structural associations of this latter system with the cell plate and early wall formation suggest a close functional relationship. These elements of fine structure will be described together with observations on the effects of physical intracellular displacement of the systems under investigation.

PORTER, K. R.

See MACHADO, R. D. and K. R. PORTER

RABINOWITCH, EUGENE. University of Illinois, Urbana, U.S.A. *Robert Emerson's investigations of the action spectra of photosynthesis (in memory of Robert Emerson)*. Robert Emerson's investigations of the photosynthesis action spectra of algae of different classes extended from 1941 to his tragic death in February, 1959, and were characterized from the beginning by clear understanding of the significance of these spectra. He measured maximum quantum yields, in truly monochromatic light, as a function of wave length, rather than — as others did and still do — the rate of photosynthesis somewhere between the regions of light limitation and light saturation, in broad spectral regions isolated by color filters. Through this work, the contribution of different pigments to photosynthesis were first established reliably and precisely, in *Chlorophyceae* (Emerson and Lewis, 1941-43) *Diatomeae* (Tandad, 1951), *Cyanophyceae* (Emerson and Lewis, 1942) and *Rhodophyceae* (Emerson and M. Brody, in press).

In modern physics, the derivation of new qualitative understanding from precise quantitative measurement of phenomena is a common path of advance; in biology, this path is only rarely available, because of difficulties of precise measurement and complexity of the phenomena. Emerson's studies of action spectra were of this rare kind. Among their most recent successes was the discovery, with M. Brody, of the dependence of the relative photosynthetic efficiency of phycobilins and of the chlorophyll in red algae on the pre-treatment of the organisms (which suggests a new aspect of the problem of mutual coupling and energy transfer between the molecules of these pigments in the chloroplasts); and the analysis (with R. Chalmers, C. Cederstrand and M. Brody) of the decline of the efficiency of chlorophyll *a* in spectral regions where it is the only absorbing pigment — above $680\text{ m}\mu$ in green algae and above $650\text{ m}\mu$ in red algae. These observations solved the puzzle of "inactive chlorophyll *a*" in red algae, raised by less precise spectral studies of other investigators, and raised instead a more fundamental puzzle of the specific function of accessory pigments (chlorophyll *b* in green algae, phycobilins in red algae, etc.) in photosynthesis. Emerson's last months were dedicated to attempts to approach this problem in his characteristic way — by further improvement of measurements, and wider variation and better control of the physiological state of the algae (such as composition of the pigment system, intensity of respiration, variations in nutrition) and of possibly relevant physical conditions (such as spatial distribution of the absorption of the far red light, absorbed only by chlorophyll *a*, and of light of shorter wave lengths, absorbed also — or mainly — by one of the accessory pigments).

An attempt will be made in the paper to review as far as possible these unpublished experimental results, and to discuss their significance for our present concepts of the primary photophysical and photochemical process in photosynthesis.

RANDOLPH, L. F. and THAVORN VAJRABHAYA, Cornell University, Ithaca, U.S.A. *The utilization of pure culture techniques in cytogenetic studies of iris and orchids.* An excised embryo-culture technique for iris and an immature seed-culture technique for *Cattleya* and *Dendrobium* orchids provide seedlings for cytological study several months earlier than with the usual seed-germination procedures; higher rates of germination also are obtained. The techniques which are utilized will be demonstrated with seeds, embryos, seedlings, and cytological preparations of chromosomes from root-tip smears.

RIKER, A. J. and PATTON, R. J. University of Wisconsin, Madison, U.S.A. *Breeding trees for disease resistance.* When devastating diseases appear, having trees or not having them may depend on disease resistance. The well-known genetic techniques used successfully with agricultural crops have been employed. The long generation time is compensated for in part by the abundant seed production, and relatively little care necessary over many years for elite trees. Certain short cuts often are available, especially vegetative propagation and flower induction. The nature of disease resistance and its inheritance often are complex. Errors occur in selecting escapes, i.e., trees that appear resistant in one set of conditions but that are susceptible in another. Because artificial inoculations usually are necessary to prove resistance, one needs an intimate knowledge of how the pathogen functions. The ability of an individual elite tree to transmit resistance through seed must be determined by progeny tests. When resistant clones are used vegetatively for planting stock, more than a dozen seem necessary. The danger with only a few is that while one was selecting for resistance to one disease, he might inadvertently have selected for susceptibility to another disease. Breeding for resistance as a major desirable character has been successful and holds great promise for disease control.

RODRIGUES, C. J., JR.

See D'OLIVEIRA, BRANQUINHO and C. J. RODRIGUES, JR.

Ross, R. British Museum (Natural History), London, United Kingdom. *The phylogeny of algae and the classification of organisms.* The following views about the phylogenetic relationships of algae and other organisms are currently becoming accepted:

- (i) bacteria and blue-green algae are primitively non-nucleate,
- (ii) the nucleus is monophyletic, and hence all other organisms form one phyletic stock separate from the above,
- (iii) the flagellum is monophyletic, and only the red algae are primitively non-flagellate, all other nucleate organism forming one phyletic group separate from them,

(iv) the nucleate flagellate organisms gave rise to various phyletic lines distinguished by biochemistry and flagellum type, e.g. green plants, brown algae with Chrysophyta and rhizopods, Metazoa, etc.

A phylogenetic classification based on these views would differ greatly from current systems — the primary division would not be between plants and animals. Organisms have characters in common because of (a) chance, (b) convergence, (c) conservatism, i.e. retention in members of two long-separated lineages of characters lost by most members of both lineages, (d) common descent. A truly natural classification relies only on these last for only thus does it express objective relationships. When one can postulate which characters belong to this class, a system based on them should be formulated, and it is suggested that this should now be done for the major groups of organisms.

ROULEAU, ERNEST. Université de Montréal, Canada. *Flores provinciales et territoriales canadiennes*. On n'a pas encore publié de Flore du Canada. La liste de John Macoun (Catalogue of Canadian Plants, 1883-1902) n'a pas été mise à jour et plusieurs mentions demeurent sujettes à caution, le présent demi-siècle ayant vu des progrès considérables dans l'exploration et la systématique.

Outre des listes de Carter, Newcombe, Graham, Henry Hulke, la Colombie Britannique est pourvue d'une flore qui couvre son secteur sud (Eastham). L'Alberta compte aussi des listes de Farr, Raup, Standley, Turner, mais pas de flore écrite. Le territoire du Yukon est compris dans la grande flore de l'Alaska et du Yukon de Hultén et le coin sud fait l'objet d'une publication de Porsild. La Saskatchewan est connue par une liste de Breitung, et Scoggan vient de publier une flore du Manitoba. L'Ontario n'a pas de flore écrite, mais de nombreuses listes locales: Bell, Dickson, Krotkov, Fletcher, J. M. Macoun, J. Macoun, Soper, etc. Quant à la province de Québec, la Flore laurentienne du frère Marie-Victorin couvre la partie habitée du Québec, celle de Scoggan traite de la Gaspésie, et plusieurs listes de Lepage, St. John, Hustich, etc. donnent une idée raisonnable de divers secteurs de l'Ungava. Le Labrador possède une littérature échelonnée sur plus d'un siècle (Meyer, Schlectendal, Abbe, Hustich, etc.), mais aucun travail d'ensemble. L'Île-du-Prince-Édouard n'a pas de liste récente ni le Nouveau-Brunswick. La flore de Terre-Neuve est actuellement étudiée par Rouleau qui a publié une liste des entités connues pour la grande île et pour le Labrador.

Paradoxalement, il se trouve que la partie arctique du Canada, la moins habitée, est la mieux connue botaniquement grâce à de nombreux travaux de synthèse de Ostenfeld, Simmons, Polunin, Porsild. Lorsque plus de flores provinciales auront été publiées, on pourra alors envisager la publication d'une flore vasculaire du Canada.

SCHNACK, BENNO. Universidad Nacional de la Plata, Argentina. *Interprotoplastic joints in the meiosis of flowering plants*. This paper refers to the inter-protoplastic joints and cytomixis which have been observed in many Angiosperms and seem to be natural and normal phenomena, par-

ticularly the former. Evidence is presented which permits to suppose that there are forces in the sporogenous tissue which attract the nuclei of pollen mother cells to the cellular limits up to the sites at which the inter-protoplasmic joints have been established in the initial stages of the first meiotic prophase.

SEINHORST, J. W. Instituut voor Plantenziektenkundig, Onderzoek, Wageningen, Netherlands. *Population studies on Ditylenchus dipsaci and some other plant parasitic nematodes*. Population densities of stem nematodes appeared to fluctuate about a relatively high level on clay soils and about a low level on sandy loams and sandy soils. On clay soils and sandy loams the population density of the onion race of the stem nematode increased considerably only when onions or peas were grown. On sandy soils the rye race increased considerably when rye and occasionally when oats were grown. Other hosts and non-hosts have little influence on population levels.

Population densities of *Hoplolaimus uniformis*, *Pratylenchus pratensis* and *P. minyus* were also relatively constant at different levels in different fields. The rate of increase of these species and also of *Ditylenchus dipsaci* on good host plants appeared to be higher the lower the initial population in the soil. This may explain the constancy of population levels; reduction of the number of nematodes invading the plants by adverse conditions in the soil is countered by a higher rate of multiplication. This leads to a balanced population density which is related to the favourability of soil conditions and the efficiency of the plant hosts available. Polyphagous nematodes, including species mentioned above, may, by living on weeds, maintain a minimum population level irrespective of the host plant grown. Damage by a nematode species can be controlled by crop rotation only if this level is below the danger level of the crop plants. Therefore stem nematode attack in onions, mangolds and carrots on clay soils cannot be controlled by crop rotation as the minimum population densities are above the danger level but on light soils damage can be avoided if onions, peas and rye are grown at sufficiently long intervals.

Unfavourable soil conditions may increase the mortality of stem nematodes in the soil and also decrease their activity. Stem nematodes are generally more active in clay soils than in sandy soils; in the latter their activity may be reduced by heating the soil or treating it with mercuric chloride, ether, chloroform or ethoxy ethyl mercury chloride. Moisture content is important on all soils.

SHANKS, R. E.

See DE SELM, H. R. and R. E. SHANKS

SHAW, M. University of Saskatchewan, Saskatoon, Canada. *The physiology of host-parasite relations in the rusts*. Modern experimental work on the physiology of the host-parasite relations of the rust fungi may be roughly classified under the following headings:

- (1) Studies on the metabolism and germination of uredospores.
- (2) Cytochemical and metabolic studies of rust infected tissues of plants and
- (3) Effects of various chemical and other treatments on rust development and resistance.

The salient findings will be briefly reviewed.

SHIELDS, LORA M. New Mexico Highlands University, Las Vegas, U.S.A. *An appraisal of radiation effects on vegetation within the Nevada Test Site.* Segments of this natural plant population have been subjected to repeated initially high exposures followed by chronic, low-level radiation. No evidence of mutational response or morphological irregularity has been established though certain fission products appear to be absorbed.

Initial radiation injury to vegetation in the 1957 test series was masked by blast and thermal effects within 0.6 mile, the radius of complete denuding, at three tower and two balloon ground zeros. The following spring four species (*Mentzelia albicaulis*, *Chaenactis stevioides*, *Erodium cicutarium* and *Gilia latiflora*) contributed the bulk of the annual cover within 1.0 mile of five tower ground zeros. Peak coverage for four of these sites ranged in late May from 70 to 117 per cent (Braun-Blanquet method) between 0.4 and 0.8 mile compared to 12 to 47 per cent for undisturbed control plots. The denser stand of *Mentzelia albicaulis* within 0.3 to 0.5 mile of ground zero evidenced survival of nuclear effects by seeds of this species. Radiation and/or thermal effects appeared to exercise a selective action in the revegetating of the area within the 0.6 mile radius, the number of annual species, but not necessarily total cover, increasing beyond this point the first year. Within 0.3 mile extensive soil removal had a selective effect on the recovery pattern. The summer annual *Salsola pestifer* assumed prominence within this radius in June.

The action of radiation as distinct from thermal and blast effects appears to be evident (a) along a line of venting from an underground detonation where *Artemisia tridentata* survived exposures lethal to *Pinus monophylla* and *Juniperus utahensis*; (b) at two tower ground zeros where no measurable stand of annuals appeared nearer than 0.5 and 0.6 mile, and standing shrubs failed to develop foliage the following year within 0.7 and 1.0 mile; and (c) at two balloon ground zeros where no foliage appeared the year after detonation on shrubs remaining between 0.6 and 1.0 mile.

SHUSHAN, SAM and WILLIAM A. WEBER. University of Colorado, Boulder, U.S.A. *Lichen flora of the Rocky Mountain region.* Current research on the lichen flora of the Rocky Mountain region has revealed many outstanding extensions of lichen ranges. Extensive field work has revealed distinctive distribution patterns, in general paralleling those of the higher plants, but in some cases suggesting much more ancient distribution patterns than these. Among the phytogeographic patterns exhibited by the Rocky Mountain lichens the following elements may be recognized:

(1) circumboreal arctic-montane (ex: *Gyalecta foveolaris*, *Toninia groenlandica*, *Cetraria commixta*) (2) north-eastern North American woodland relicts (ex: *Parmeliopsis placododia*, *Cetraria fendleri*) (3) Mexican (ex: *Buellia novomexicana*, *Candelariella submexicana*, *Physcia setosa*) (4) desert element disjunct in N. Amer., N. Africa, and Central Asia (ex: *Lecidea pavimectans*, *Catillaria sculpturata*, *C. kansuensis*) (5) ancient greatly disjunct element including bipolar species (ex: *Stereocaulon albicans*, *Normandina pulchella*). Endemism is apparently a very minor characteristic of the Rocky Mountain lichen flora (ex: *Candelariella spraguei*, *Polyscaulionia cladodes*).

SIMINOVITCH, D. Plant Research Institute, Canada Department of Agriculture, Ottawa, Canada. '*Rejuvenation*' of senescing apple fruit tissue in liquid media. Film. Senescence and deterioration can be arrested and fresh vitality restored to cells of tissues of senescing apples when excised and incubated in liquid media with aeration. This is demonstrated by a film of the active streaming of protoplasm and prominence of mitochondria developed and sustained in the cells of these tissues even after periods of incubation 2 — 6 months.

SINGER, ROLF. Universidad Nacional de Tucuman, Argentina. *The genus of agaricology*. Since the twenties (if forerunners and pioneers are disregarded) a trend toward transformation of what had virtually been a form genus into a natural genus has been under way in agaricology. Instead of seeing this process as a change from one rigid scheme to another, we prefer to consider it an evolution of systematic thinking, one which has also taken place in other fungi (Cantharellales, Gasteromycetes, Ascomycetes) and cryptogams (Polypodiaceae, algae). This trend develops on the basis of the discovery of new characters and new, especially "exotic" species. Generic taxonomy cannot be based on a limited set of characters (only morphological) or on the study of a local flora (Gilbert's bolete classification). This trend leads to an increase of taxa in the world flora but does not necessarily imply atomisation of existing genera (*Mycena*, *Acutis*, *Bolbitius*, *Polyporus*, *Cortinarius*, *Lactarius*, etc). The size of a genus is basically determined by the hiatus delimiting it. Its "valence" is not equal in all families just as the "valence" of a species is not equal in *Alchemilla* and *Araucaria*. Transitions are often pseudotransitions (belonging in another circle of affinities than either unit). If taxonomists had given in to "conservative" trends among applied fields, *Armillariella tabescens* would still be *Clitocybe*, *Mycena citricolor* would still be *Omphalia*, or perhaps both — *Agaricus*. What should be avoided is the resetting of the system on the basis of other characters replacing formerly used characters, without consideration of all serviceable characters; generalization of the value of one character in an entire order or class (amyloidity, clamp connections, veil) instead of individual evaluation in each case. Aside from anatomical characters, physiological, chemical, cytological ones must be taken into consideration. Phytogeography and the experimental and applied fields can benefit enormously from acceptance of natural genera (and even from an acceptance of rules of nomenclature!) as has been shown (Singer 1950) at several opportunities.

Every system of classification can be improved in detail. Such recent improvements can be seen in *Marasmiellus*, *Boletellus*, *Fayodia*, *Kuehneromyces* etc. The worst "characters" are intellectual rigidity and prestige.

SOROKIN, CONSTANTINE See KRAUSS, ROBERT W. and CONSTANTINE SOROKIN

STADELMANN, EDUARD J. University of Freiburg, Switzerland and Ohio State University, Columbus, U.S.A. *Results of improved applications of the plasmometric method for permeability research*. To measure the permeability (quality of a membrane concerning the migration of particles through it) of the protoplasmic layer of the single plant cell the following equation

$$\frac{dn}{dt} = K.A. (C - k)$$

can be applied if the transport is produced solely by diffusion.

Using sufficiently high external concentrations of the permeating substance and cylindrical cells the protoplast takes the form of a cylinder with hemispheres at the ends. The equation now can be integrated and an absolute value for the permeability of the protoplasmic layer (the permeability constant K) derived from:

$$K = \frac{b}{4} \cdot \frac{L_2 - L_1 - \frac{b}{3} \cdot 1n \frac{L_2}{L_1}}{(L_0 - \frac{b}{3}) \cdot (t_2 - t_1)}$$

where: K is the permeability constant with the dimension $\frac{\text{Length}}{\text{Time}}$

b is the cell diameter which is the cell breadth.

L₀ is the length of the protoplast in the state of complete plasmolysis in a sugar solution of the same concentration as the solution of the permeating substance to be tested.

L₁ and L₂ are the lengths of the protoplast at times t₁ and t₂.

t₁ and t₂ are the measurement times.

From this formula two inferences can be made and then proven in experiments. Further peculiarities are found concerning the recovery of the protoplasm. A photographic method can be used to measure a large number of cells simultaneously.

Reference (with further citations): Stadelmann, Ed.: Zur Permeabilität der Epidermiszellen von *Carduncellus eriocephalus*. Protoplasma 50, 51-81 (1958).

STARR, RICHARD C. Indiana University, Bloomington, U.S.A. *Induction of the sexual cycle in algal cultures.* The presence of an asexual spore stage in the life cycle of many haploid algae has enabled us to establish clonal cultures which can be maintained in their genetically pure state with a minimum of effort, but the induction of the sexual cycle in such cultures has not been achieved in most instances. The formation of gametes by a physiological transformation of existing vegetative cells as in the isogamous *Volvocales*, or by processes involving morphological changes as well, as in *Oedogonium* and *Vaucheria*, indicates the need for a variety of experimental approaches in attempting to isolate algal cultures in which the sexual response can be induced. The primary isolation of potentially sexual strains, the knowledge of the environmental conditions which have been found to be effective in other instances of sexual induction, and a knowledge of the processes involved in the transformations of vegetative cells into gametic cells should in time furnish us with a great number of algal strains with excellent research potential.

STARR, RICHARD C. Indiana University, Bloomington, U.S.A. *Morphogenesis in desmids.* Symmetry of the cell is a unique characteristic of the group of green algae known as the desmids. Although this characteristic is used to delimit various genera, the symmetry of cells within a single genus may vary on occasion. The stability of this characteristic, as well as its variability in cells with the same nuclear constitution, has been studied to determine the relative roles of the nucleus and the cytoplasm in effecting the symmetry. The stability of some aberrant cell shapes through both sexual and asexual reproduction indicates that control may be a function of both nucleus and cytoplasm at different times in the life cycle. The mechanism of cytoplasmic control is discussed. Examples of normal and aberrant cell shapes are illustrated for various desmid genera.

STEFFENSEN, DALE. Brookhaven National Laboratory, Upton, U.S.A. *Structure and stability of chromosomes in the irradiated cell.** Chromosomes of higher plants and animals have been shown to be multistranded structures by a number of electron microscope studies. Chromosome breakage and mutational events must be interpreted in light of these findings. Additional evidence and theory is presented to explain the aggregation and orientation of macromolecules into chromosomes taking into account four or five kinds of secondary chemical bonds. Undoubtedly the most important of these cohesive forces are hydrogen bonds, ionic bonds (salt links) and metal complexes. Some evidence is provided concerning divalent metal complexes, particularly about the role of calcium in chromosome stabilization. A perspective is given to the findings in relation to "hit" theory. — Special consideration is given to the analysis of dose curves where chromosome aberrations in *Tradescantia* were produced in presence and absence of oxygen. The protective and enhancing effects afforded by various metabolic inhibitors can be explained on the basis of altered chromosome movement. Restitution of broken chromosomes to the original state occurs when movement is retarded or stopped. Conversely chromo-

some exchange is increased by agents which promote chromosome movement.

* Research carried out at Brookhaven National Laboratory under the auspices of the U.S. Atomic Energy Commission.

SYMOENS, J.—J. Université d'Elisabethville, Congo belge. *Le développement massif de Cyanophycées planctoniques dans le lac Tanganyika*. Le lac Tanganyika a eu longtemps la réputation d'être un lac oligotrophe, n'hébergeant qu'un plancton pauvre. De fait, ses eaux sont ordinairement très transparentes: transparence constamment supérieure à 10 m pendant la plus grande partie de l'année, et supérieure à 15 m pendant plusieurs mois; nous avons noté, en saison des pluies, un maximum de 18, 2 m (devant Uvira). D'autre part, l'absence apparente de vie planctonique, en surface et de jour, semble habituelle et confirme cette réputation de pauvreté dans l'esprit de la plupart des observateurs.

Cependant, en fin de saison sèche (septembre et octobre), nous avons observé, dans la bassin nord du lac, le développement massif de Cyanophycées (*Anabaena flos-aquae*) qui aux moments calmes de la journée, forment des voiles verts, parfois continus sur plusieurs hectares, à la surface du lac ("fleurs d'eau" semblables à celles des lacs eutrophes des régions tempérées). L'eau superficielle en devient presque sirupeuse et dégage une odeur caractéristique, rappelant celle des légumes hachés.

A ce moment, la transparence de l'eau tombe à rien, le disque de Secchi disparaissant, aussitôt après son immersion, sous la couche opaque que les Cyanophycées forment en surface. Lorsque le vent se lève, en fin de matinée, il désagrège la pellicule algale superficielle, celle-ci se dissociant promptement en trainées vertes, dont les filaments descendent ensuite sous la surface; et bientôt, sur les plages bien exposées au vent, les vagues font déferler une eau étonnamment verte.

Nous attribuons cette pullulation soudaine d'*Anabaena* à l'enrichissement de l'eau dû à l'abaissement du thermocline sous l'effet des tempêtes de la saison sèche.

Une poussée annuelle du zooplancton succède de près à l'apparition des premières "fleurs d'eau" (seconde moitié de septembre): maximum planctonique révélé par des pêches verticales au filet fin; abondance, en surface, de jeunes Copépodes (nauplii et copépodites); abondance aussi des Crevettes planctoniques (*Limnocaridina retarius*).

TAYLOR, JANE. University of Cincinnati, U.S.A. *Terminal branching in the Lepidoziaceae*. These remarks are limited to those types of terminal branching as exemplified in the Lepidoziaceae namely, the *Frullania* type, the *Microlepidozia* type and the *Acromastigum* type. In each of these types of terminal branching the branch is formed in a segment-half soon after the segment is cut off from the apical cell of the branching axis and as a result, the leaf or underleaf, which normally originates in the entire segment, is restricted to the remaining segment-half and is therefore considerably modified. The interrelationships of the above mentioned types of branching

have been investigated by means of the modified leaves and underleaves of the branching axis of the adult plant which occur at the base of the branches.

It has been found that the *Frullania* type occurs independently or in association with, the *Acromastigum* type only, the *Microlepidozia* type only, or with both the *Acromastigum* type and the *Microlepidozia* type. The *Acromastigum* type and the *Microlepidozia* type never occur without the presence of the *Frullania* type. Only 10% of the possible variation patterns are known to occur, while each genus, excluding incorrectly assigned species, is characterized by one variation pattern only.

Illustrations of specific examples of the branching types selected from the various genera of the family will be demonstrated by lantern slides.

THOMPSON, RUFUS H. University of Kansas, Lawrence, U.S.A. *Morphological adaptation and physiological interdependence in freshwater algae*. With the ubiquity of the fresh-water algae it is recognized that as a group their ecology can be discussed in broad generalities only. Such generalities include the lake, permanent pond, river, marsh, bog, shallow and intermittent water, soil and aerial habitats. These habitats may be grouped in two main ecological conditions: the relatively stable and the drastically fluctuating. Within this framework are discussed morphological adaptation, physiological interdependence, temperature and pH, and special ecological niches.

THOMPSON, RUFUS H. University of Kansas, Lawrence, U.S.A. *Some aspects of phylogeny in the Chlorophyta*. The current schemes of green algae phylogeny are reviewed. These reflect the evolutionary philosophy, inherent in Blackman's tendencies, that evolution in the algae has been from a motile unicell along three major lines. One has led to the motile colony; another to an immobile colony and on to the coenocytic condition; and, a third has led to a simple filament, to a branched filament and ultimately to a parenchymatous plant body. In other words this is an evolution from unicellularity to multicellularity, from relative simplicity to seeming complexity; one of progressive elaboration.

A different phylogenetic scheme is presented based on a different point of view of evolutionary sequence. It is one which the author feels more nearly relates the diverse algal forms in the Chlorophyta; explains their derived condition relative to their environment; and, is in harmony with evolutionary thought in other fields of biology.

Fundamental to the development of this new approach have been the following premises:

That evolution has been a modification, a reduction, of preexisting functions and structures and not an elaboration of de novo structures.

That evolution has been en masse whether in "cellular" aggregates or in populations and not by individuals.

That the living algae are wholly derived, relative to their environmental niches, and are today at the present apex of a tremendously long time of evolutionary development.

That regardless of how little or much they may have diverged from ancestral forms they have evolved in their own right to the status of being algae plants and in no way does their morphology directly reflect evolution to higher plants.

TOWERS, G. H. N. See AVADHANI, P. N., S. K. GRIDALE,
R. K. IBRAHIM and G. H. N. TOWERS

VAJRABHAYA, THAVORN See RANDOLPH, L. F. and THAVORN
VAJRABHAYA

WAREING, P. F. See BLACK, M. and P. F. WAREING

WASSINK, E. C., Laboratory of Plant Physiological Research, Agricultural University, Wageningen, Netherlands. *Some aspects of photocontrol of plant growth and development*. In this lecture some aspects of the relation between light and plant growth and development are discussed. Emphasis is being laid upon the distinction between energetic and stimulatory effects of light, and on the relative significance of "etiolation" and "critical day-length". Examples are mainly taken from work of the speaker's laboratory.

Light, in principle, acts on plants in two different ways, viz, as light energy, and as light stimulus, directing other available energy sources. Often both effects distinctly interfere, so that the energy level of the plant determines the effect of a light stimulus, both quantitatively or qualitatively. The quality of the light is very important, and the effect of various spectral regions may vary both in quantity and in quality. The general contentions of "etiolation" and "critical daylength" do not appear to stand up against a spectral analysis. More etiolation may be produced by applying more radiation, e.g. by supplying short days with an amount of radiation (e.g. blue light) containing no more than traces of near infrared. Similarly, according to the light qualities in the radiation scheme, a long day plant may flower easily in short days or with difficulty in long days, and the reverse may hold for short day plants.

The understanding of formative and photoperiodic effects requires detailed analysis of the effects of various spectral radiation schemes, and their interaction with the plant's metabolism, both on the energetic and the hormonal side.

For this, the study of relations and interactions between light effects and the effects of other agents (of which nitrogen supply, action of specific chemicals, and varietal differences have been quoted as examples) may be of considerable importance.

WEBER, WILLIAM A. See SHUSHAN, SAM and WILLIAM A.
WEBER

WHITAKER, THOMAS W. University of California, Davis, U.S.A. *Biosystematics of the cultivated Cucurbita*. The 5 species of cultivated *Cucurbita* have 20 pairs of chromosomes and are composed of 4 annual (*C. pepo* L., *C. mixta* Pang., *C. moschata* Duch., *C. maxima* Duch.) and a perennial species (*C. ficifolia* Bouché). Plants of this group are strikingly similar in appearance because of a strong tendency toward parallel variation both in morphological and reproductive structures; for example, several species have cultivars with both determinate (bush-type) and indeterminate (vine-type) growth habit; cultivars with smooth and warty fruits occur in most species, etc.

There is archeological evidence to show that each species has developed sterility barriers effective enough to maintain its identity, over a period of at least 5000 years under cultivation. At innumerable times during this period cultivars of these species have probably been grown in the same area, or in the same garden plot. There are no reports of spontaneous hybrids in this group, although many trained observers have given this problem critical attention. The specific nature of the barriers to genic exchange is not known, but work with rates of pollen tube growth indicate the relationships are not simple.

While it is possible to obtain fruits from reciprocal matings of most of these species, the results are highly variable, dependent upon the species and cultivars used in the matings. The majority of the fruits contain few, if any fertile seeds. If F_1 plants are produced they are usually selfsterile in crosses with each parent.

WHITE, PHILIP R. See DE TOROK, DENES and PHILIP R.
WHITE

WILLARD, WILLIAM K. See ODUM, EUGENE P. and WILLIAM K.
WILLARD

WOLFF, SHELDON. Oak Ridge National Laboratory, U.S.A. *Studies on the biochemical nature of intergenic mutations*. A large portion of radiation induced mutations, classified as intergenic mutations, are the result of changes within and between the chromosomes. These are dependent upon chromosome breakage and the subsequent rejoining of the breaks in new combinations. By administering fractionated doses of X rays to *Vicia faba* seed and applying specific metabolic inhibitors between the two doses, we have been able to study the biochemical nature of the rejoining process. Rejoining is not a passive physical process as was once thought but requires cellular metabolism and the formation of adenosine triphosphate. There is a postirradiation period in which cellular metabolism can affect the repair of premutational damage and so decrease the numbers of mutations induced. Further studies utilizing chloramphenicol as a protein synthesis inhibitor have shown that it prevents chromosome breaks from rejoining. Chloramphenicol has been shown to inhibit the incorporation of labelled amino acids into the proteins of the root tips, but not to affect the incor-

poration of P^{32} into the nucleic acids. Furthermore, DNA synthesis has been found not to occur at the time breaks rejoin. These experiments have been interpreted to indicate that protein synthesis is necessary for breaks to rejoin.

WOODS, M. W.

See DUBUY, H. G. and M. W. WOODS

WORTHLEY, ELMER G. Owings Mills, U.S.A. *An ecological study of an Antarctic moss.* An ecological study of *Bryum antarcticum* H.f. & W. was made at Cape Hallett, Antarctica, during the austral summer of 1958-1959. Microclimate data, especially on temperature measurements in relation to the moss clumps were recorded. Varying photoperiods and thermoperiods were initiated with various study clumps and their effects on vegetative growth and sporophyte production is discussed.

ZINKE, PAUL J. University of California, School of Forestry, Berkeley, U.S.A. *The pattern of influence of individual forest trees on soil properties.* The soil under the influence of a forest develops properties that vary spatially with relation to the location of the trees. The pattern of variation of soil properties under individual forest trees is generally developed with symmetry radial to the tree. The soil properties vary with distance from the tree in manner such that there is a systematic change in pH, nitrogen content, content of exchangeable bases and exchange capacity, and volume weight. This variation is associated with differences in the effects of bark litter, and the adjacent opening or neighbouring tree. The patterns obtained, herein called "influence circles", are predictable in a forest region. The ground flora often develops in response to these patterns. Examples are given of variation in soil properties under individual trees of *Pinus contorta* Dougl., *Pinus ponderosa* Laws., *Pseudotsuga menziesii* (Mirb.) Franco, and *Libocedrus decurrens* Torr. in various areas in California.

